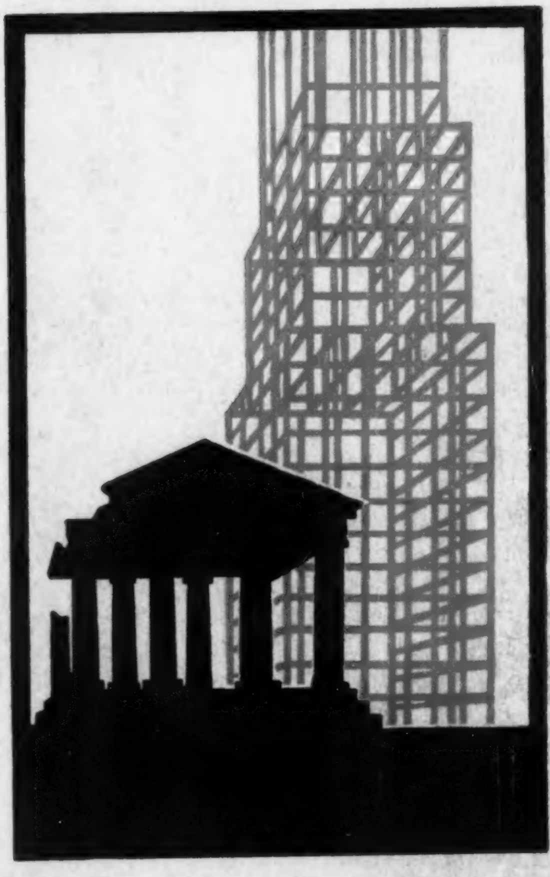
THE ARCHITECTURAL RECORD



NOVEMBER

1930

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THE ARCHITECTURAL RECORD

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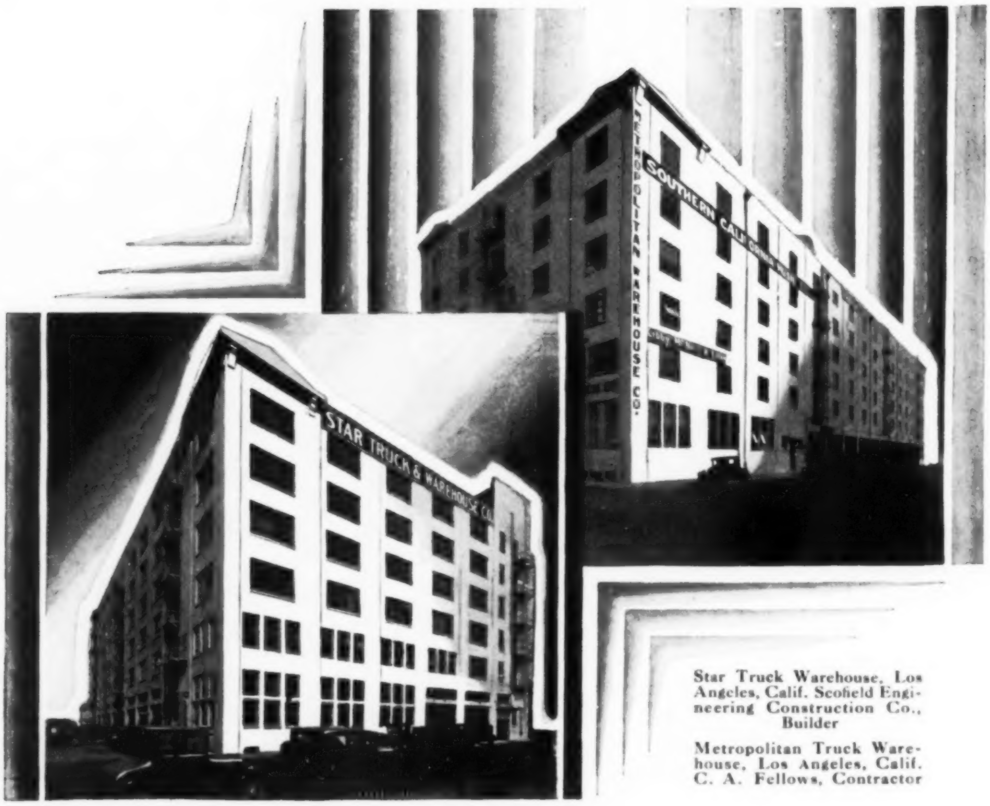

Both of these buildings were designed and are owned by the Santa Fe Railway Co. Sixty tons of Truscon Metallic Floor Hardener were used to protect all floors of both buildings against the wear of traffic.

Star Truck Warehouse, Los Angeles, Calif. Scofield Engineering Construction Co., Builder

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UNEMPLOYMENT OF DRAFTSMEN

The decline in building construction has forced many draftsmen out of employment. The situation demands immediate attention, since improvement in the building industry is expected to be gradual.

One solution of the unemployment problem may be the shortening of working hours and the working week, where possible. Another suggestion is the use of spare time to initiate new building projects, to study improved methods of office routine, and otherwise prepare for more efficient service when new business begins to come in.

Steps for meeting unemployment are now being undertaken by various architectural organizations. The cooperation of all architects and others in the allied fields is invited. The Architectural Record asks that suggestions from architects and draftsmen be sent in to be submitted to a committee now being formed to discuss plans for meeting the situation.

CALENDAR OF EVENTS

Nov. 12, 13, 14	National meeting of American Institute of Architects, Detroit.
Nov. 15	"Man and Machines", an exhibit representing western industrial civilization, at Museums of the Peaceful Arts, 220 East 42nd Street, New York City.
Nov. 18-19	Art Exhibition, Royal Institute of British Architects, London (9, Conduit Street).
Dec. 1	Competition for "esthetic improvement" in design of water tanks, sponsored by Chicago Bridge and Iron Works, Alvert M. Saxe, 430 N. Michigan Avenue, Chicago, architectural advisor.
Dec. 1-6	Ninth National Exposition of Power and Mechanical Engineering, Grand Central Palace, New York City.
Dec. 5-6	The Florida Association of Architects will meet at Fort Meyers, Florida.
Dec. 16	Address by Arthur Holden, Junior League of the N. Y. Society of Architects. Apply to L. E. Jallade, 15 East 47th Street, New York City.
Jan.-Feb. 1	International Exhibition of Persian Art, Royal Academy, London.
Jan. 23	Beaux-Arts Annual Ball, Hotel Astor.
Through Feb.	Annual exhibition of the Architectural League of Greater Miami, Florida.
March 30-April 4	House and Garden Exposition, Grand Central Palace, New York City.
April 18-25	Fourth Biennial Architectural and Allied Arts Exposition, Grand Central Palace, New York City.
June	International Town Planning and Housing Federation Congress, Berlin.

ANNOUNCEMENTS

Walter F. Bogner, architect, announces the removal of his office to 45 Newbury Street, Boston, Mass.

Rankin and Kellogg, architects, announce the removal of their offices from 1805 Walnut Street to the Architects Building, 17th Street at Sansom Street, Philadelphia, Pa.

Gerad W. Wolf, architect, announces the removal of his office to Central Building, Clayton, Mo.

Carl F. Pilat, landscape architect of 15 Park Row, New York City, has been appointed landscape architect of the Constructing Division of the War Department. He will continue his general practice in New York and Ossining and conduct the duties of his new office through associates and assistants.

JUNIOR LEAGUE OF THE NEW YORK SOCIETY OF ARCHITECTS

The New York Society of Architects has extended its activities so as to admit into this body an auxiliary organization or Junior League. This is intended to be of benefit to the draftsmen or junior architects who are not yet registered under the law.

The object of this new organization is principally educational and partly social. A program for the winter season covers the following subjects:

The Education of an Architect
The Functions of an Architect and His Relations to the Client
Modern Tendencies in Design
Methods of Studying a Project Beginning with the Sketches
Taking of Estimates and General Practice of Letting Contracts
Supervision of Work in Field
Technique of Writing Specifications
Office Administration, Organization and Cost of Producing Drawings
Selection of Building Materials
Legal Standpoint of the Profession

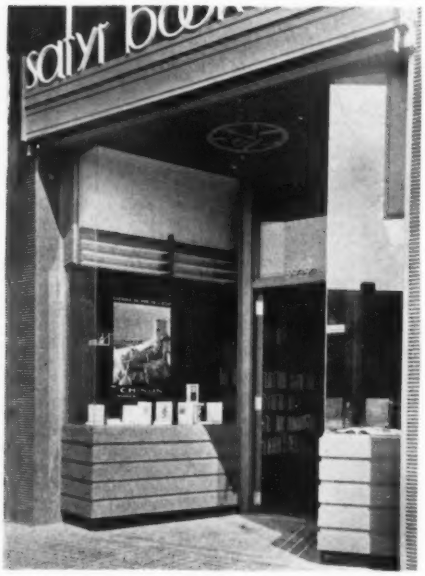
The work will be directed by Colonel Louis E. Jallade. Admission to the talks will be opened to all draftsmen who are interested, applying to Louis E. Jallade, 15 East 47th Street, New York City.

THE DECEMBER ISSUE

includes among other features . . .

CRANBROOK ACADEMY, MICHIGAN
ELIEL SAARINEN, ARCHITECT

This academy of art is not only for study but also for work. Painters, architects and craftsmen may come here to develop projects with the benefits of association with other skilled workers. The studios, drafting rooms, experimental workshops, library, museum, lecture rooms and apartments for visiting artists have been designed by Mr. Saarinen.



PORTFOLIO OF STORES

Shops and small stores present individual problems of design and construction to meet the specific purposes for which they are used. Each solution however may have ideas and innovations that can be utilized in similar structures. The portfolio has been selected with this in mind. It includes a chain food store by Ralph Bencker, a bookshop by J. R. Davidson, a confectionery shop by Jo Brandes, a branch clothing store by Dreher and Churchman, and a perfume shop by Thompson and Churchill, architects. Working drawings and details are also included.

TECHNICAL NEWS AND RESEARCH: NEWSPAPERS AND PUBLISHING PLANTS

This study of an economically important and technically complicated building type lists the general requirements for personal comfort and mechanical efficiency in each phase of the process of turning manuscript copy into printed page form. Relationship to community in choice of location is noted. Likewise such technical problems as air conditioning, flooring, vibration-proofing and lighting.

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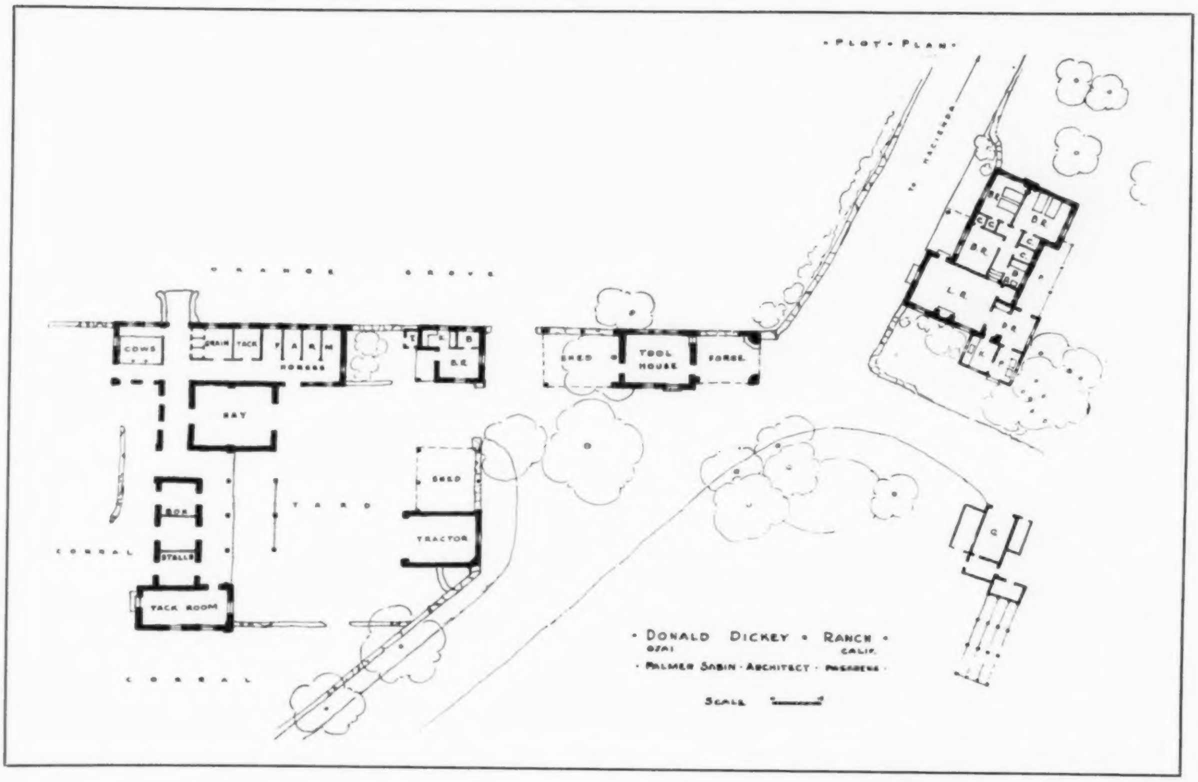
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COWS
GRAIN
TACK
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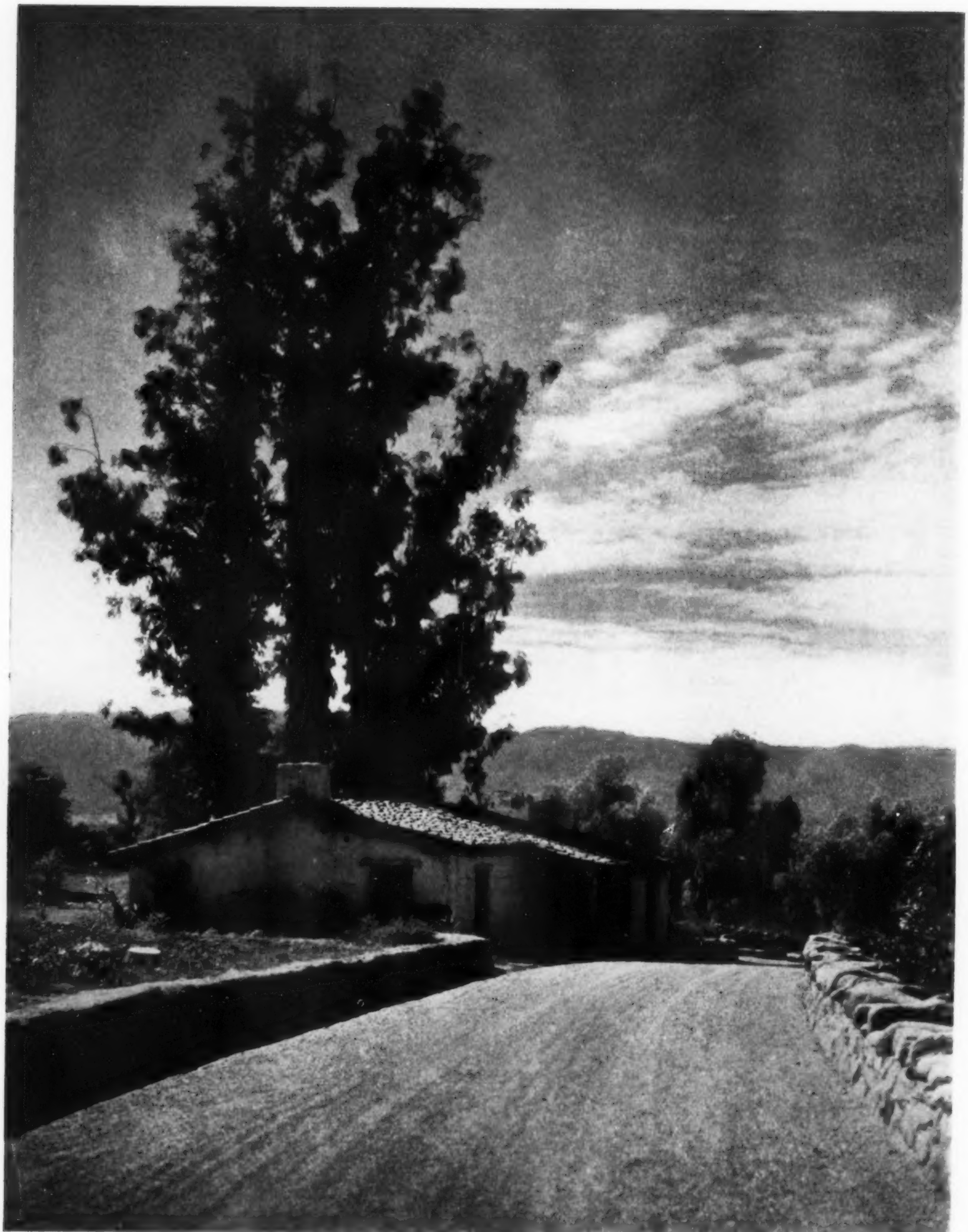
TACK ROOM
CORRAL
CORRAL
SHED
TRACTOR
B.R.
L.R.
D.R.
K.
G.
DONALD DICKEY RANCH
OJAI CALIF.
PALMER SABIN · ARCHITECT · PASADENA
SCALE



Padilla Studios

RANCH HOUSE OF DONALD DICKEY
OJAI, CALIF.
PALMER SABIN, ARCHITECT

(See plan on other side)

THE ARCHITECTURAL RECORD

AN ILLUSTRATED
MONTHLY MAGAZINE
OF ARCHITECTURE

VOLUME 68 NUMBER 5 NOVEMBER 1930

THE COUNTRY HOUSE

By HOWARD T. FISHER

ORIENTATION OF ROOMS

In most parts of America sunlight constitutes a precious commodity, especially during the winter, and the ideal room for most uses is one with east, south and west exposures thus enjoying sun throughout the entire day. This will, however, seldom be possible except with perhaps one or two rooms of the house, and the question therefore arises as to the best placing of the other rooms. In certain cases, of course, other considerations, such as view and trees, may be more important than sun in determining the disposition of rooms.

Living room. This room, as well as other rooms that may be extensively used during the day, such as the play room, should be given a southern exposure, and if possible both east and west exposures. Where both of the latter cannot be provided the western exposure is more important as it is probable that the rooms in question will be more apt to be occupied continuously in the afternoon than in the morning.

Dining room. A southeastern exposure is desirable for a dining room as this will give sun both for breakfast and lunch. An eastern exposure alone may be found satisfactory as the morning sun is especially attractive at breakfast. Western sun in a dining room has no particular merit as throughout most of the year the evening meal is eaten after dark.

Bedroom. An eastern exposure for a bedroom is objectionable to many people as the sun tends to wake them up. It has, however, the advantage that the occupants may enjoy the sun while dressing. A western exposure should not be provided for a children's bedroom or nursery as during the summer, especially with daylight saving, the light from the setting sun will keep the children awake long after they are put to bed. A purely northern exposure will be adequate for bedrooms not usually occupied during the daytime. Sleeping porches, however, should not ordinarily open to the north on account of the severity of the wind from that direction.

Bathroom. An east exposure providing sunlight in the morning while dressing is by far the most desirable for a bathroom.

Kitchen. Ordinarily occupied for many hours of the day the kitchen deserves a sunny exposure. Where the housewife does her own work she will be wise to place the importance of the location of the kitchen even above that of the living room. A purely western exposure should perhaps be avoided because of the heat in summer from the late afternoon sun.

Garage. The garage is the one room which can be advantageously located in the middle of the north side of the house as neither sun nor cross draft is of any importance.

Cross draft. In locations subject to hot weather the prevailing winds should be studied and adequate provision for cross draft made in all rooms, especially bedrooms. When bedrooms have windows on only one side the door should connect directly with a hallway through which the air may freely circulate. Louvred doors permitting the passage of air but providing privacy may be worthwhile, especially for guest rooms. To increase the flow of air during the summer, as well as to permit during the winter a more rapid cooling off of the bedroom on retiring, vent ducts, either gravity or fan-operated, may be provided near the ceiling on the wall opposite the windows.

SLEEPING PORCHES

Advantages. In summer the sleeping porch affords a cooler and airier place to sleep. By its use in winter

the bedroom may be kept warm thus providing a comfortable room in which to dress in the morning. Perhaps even more important is the fact that in winter it is possible to go to sleep in a cool place instead of having to retire in a room still warm and which may take several hours to cool off.

Location. To assure an adequate cross draft sleeping porches should always be open on at least two sides. Wherever possible they should be located so as to connect directly to the rooms they serve. The ideal arrangement is for each room to have its own porch.

Construction. The porch may be either entirely open except for screens or else equipped with windows so as to be capable of being completely shut. In the latter case in order to get the maximum of air the windows should occupy all or nearly all of the outside wall area and if possible should open to the floor to permit the utmost cross draft in hot weather. Where the porch is left open additional beds will have to be provided inside for use in bad or very cold weather or in case of illness. However, where the porch is heated and capable of being completely closed this is unnecessary and the bedroom can be converted into a private dressing and sitting room.

DINING PORCHES

The dining porch should be directly accessible from the kitchen, or butler's pantry if one is provided, in such a way that a minimum amount of travel is required in serving. If the porch is equipped with windows so that it can be completely enclosed, the total number of days during which it can be used will be greatly increased. On the other hand this should not be carried too far as its porch character should definitely be preserved if it is to have any advantages over the dining room proper.

"PILLAR CONSTRUCTION"

Elimination of basement. Where economy is essential there has been for some time a growing tendency to omit the cellar as a standard feature of house design. With present methods of heating it is no longer necessary to locate the boiler or furnace at a level below that of the rooms to be heated. In smaller houses the laundry tubs can be located in the kitchen and in larger residences, where it may be desired to do the laundry in the house, a special room provided above ground with proper ventilation. The cellar, once required for the storage of coal, food supplies, trunks, window screens, etc., is no longer needed for this purpose. What storage space may be necessary can be better provided elsewhere.

While there may be some excuse for the present practice of remodelling existing cellars so as to provide additional living space instead of storage space no longer needed, there is certainly no real justification for designing a new building with living rooms below the ground level. Rooms intended for human occupancy should be placed where they can have large sunny windows, an attractive outlook and good ventilation. Even when entirely dry a cellar with small windows, no sun, no view and little air is no place for children to play or adults to sit.

Use of piers. With the elimination of the cellar, continuous bearing walls are no longer necessary for the support of the building and it will probably be found more economical to employ isolated piers. With the use of piers, however, the main body of the house can be easily located 9 or 10 feet above the ground.

Economy of cost. The cost of excavating and hauling away earth is reduced to only what may be involved in providing footings below frost for the supports. Beams carried on columns take the place of the continuous basement wall as a means of supporting the floor. Exposed to the outside air on its underside the floor must be insulated, but after insulation the total heat loss will be far less than that normally taking place through the floor and walls of an uninsulated basement.

Planning the ground area. By raising the main body of the house there can be preserved for use as a play or sitting place that ground area ordinarily lost, a fact of real importance where the house is located on a small lot.

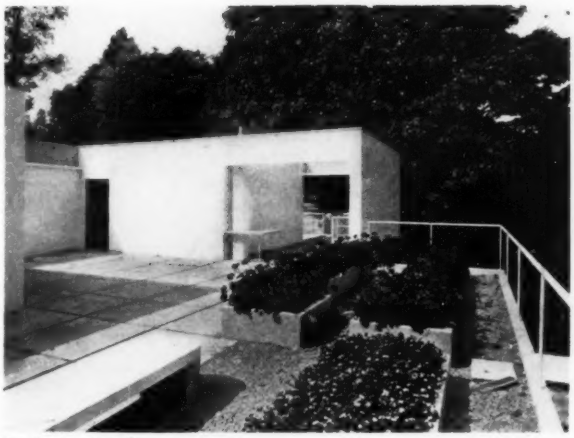
The space under the house may be partly planted with grass and flowers, the rest treated as a terrace with flagging, or the entire area may be screened in to make a sitting porch.

Stairs may be either exposed or located in an enclosed stair-well set under the central portion of the house, the latter having the advantage that the approach will be fully sheltered by the building. This arrangement also permits access directly to an interior hallway above. An enclosed stair-well provides a means of concealing and protecting from frost the necessary supply pipes and sewage drains.

The automobile driveway may be carried under the house in such a way as to give the advantage of a porte-cochère. Where a garage is to be provided it should, of course, be located at the ground level under the house. If conditions permitted, doors might be placed at each end of the garage so that the car could be driven in one end and out the other without having to back out or turn around. Where no garage is provided the space under the house would furnish a convenient place to park a car out of the weather.

If desired the boiler or furnace can be located at the ground level in a small room built either in connection with a central stair-well or off the garage. It might be worthwhile to install a dumbwaiter directly accessible from the ground level and, if no incinerator is provided, a built-in refuse box into which waste material could be deposited from above.

Where the lot is small the house will have less tendency to cut up the property. There will be no front or rear portions of the building as all parts will be equally finished and equally open and accessible. By raising the living room one-story height above the ground level greater privacy will be procured.



L'Architecture Vivante

VILLE D'AVRAY FRANCE
LE CORBUSIER AND P. JEANNERET
ARCHITECTS

ROOF PORCHES & TERRACES

Advantages of roof location. The roof usually provides a more open outlook and a better view than is possible at a lower level. Less cut off by trees, shrubbery or nearby houses, and open on all sides, it enjoys a cross draft no matter from what direction or how gently the wind may blow. As a result a roof porch or terrace will ordinarily be found far cooler in warm weather than one located at the ground level.

Because of the greater air movement and the height above the shrubbery there will also be less trouble from insects. Even where insects are unusually bad, sitting out of doors on a roof terrace without screens will probably be found possible if lights are not turned on. This constitutes a very considerable advantage in hot weather, as screens greatly reduce any existing air movement.

Raised above the level of the street the roof porch or terrace is more removed from the public view and so provides greater privacy. Also because the sun is less cut off by surrounding trees the roof affords an excellent place for sunbathing. Perhaps the greatest single advantage of porches located on the roof is that during the winter they do not cut the sun off from any of the rooms of the house.

Economy of area. Where sloping roofs are employed their entire area is unusable and so a total loss. In addition to the extravagance of this arrangement the loss of usable area may constitute an item of considerable importance, especially where land is at a premium and the house is located on a small lot. By the use of a flat roof, the ground area occupied by the house is, in a sense, not lost but merely raised to more advantageous position. Where a house is built on a steep slope the flat roof may give a level area not otherwise possible to provide. As a place for children to play, it may even have certain advantages over an equivalent amount of ground area, especially in spring when conditions may be too muddy for regular outdoor play. Constituting a sort of hurricane deck it provides an excellent place for such games as deck-tennis or ping-pong, and can be equipped with sand boxes, slides, etc. As a place to raise plants and flowers it may have advantages as well, the claim being made by Le Corbusier that they grow better in roof gardens than in the open ground on account of the heat furnished by the building.

FLAT ROOFS

Advantages in design. The architect is unhampered by the necessity of providing an area of a size and shape capable of being covered with a sloping roof economical in construction. Freer use may be made of interior rooms, stairs or hallways, ordinarily to be avoided with sloping roofs because of the difficulty of providing with light or air. The total overall height of the building may, where desired, be kept much lower than is possible with a sloping roof.

Advantages in construction. That the flat roof, considered purely as a means of keeping out the weather, is easier or more economical to construct is clearly demonstrated by its almost universal use in commercial buildings. Where used for porch or terrace purposes it must be surfaced in some satisfactory manner to permit its being walked upon but otherwise the problem is essentially the same in residential as in commercial work. What snow may fall on the roof is, of course, permitted to stay there. It can do no harm and will only help to keep the house warm. If by chance it may interfere with the use of the roof as a play area, it can be easily shoveled off.

The flat roof permits the use of interior down spouts. Carried down inside the building where they cannot freeze, these will be found far more satisfactory than the sheet metal gutters and conductor pipes now in common use.

PLANNING THE ROOF AREA

The roof can be used for sitting, eating, sleeping or play purposes. It can be left as an open terrace, or can be covered, either with awnings or a permanent

roof to produce a porch. The porch can be either screened or left open, although in most parts of America it will probably be advisable to provide screens during the summer months.

Dining porch. As a place to sit and as a place to play, whether on a screened porch or on an open terrace, the roof offers an ideal location. For dining purposes, however, the roof will probably not be found satisfactory unless a waitress is to be employed and a service pantry is provided together with a high-speed dumbwaiter connecting directly with the kitchen. It has been suggested by Le Corbusier that the kitchen and dining room be built at the roof level to prevent cooking odors from entering the rest of the house. If this were done meals could, of course, be served on a roof porch or terrace with the utmost ease.

Sleeping porch. For sleeping purposes the roof is ideal in every way with the one important exception that for greatest convenience a sleeping porch should connect directly with the bedroom or dressing room of a person who is to occupy it. Where this direct connection is not possible for any reason the roof will be found an excellent location. If convenient the sleeping porch should be located adjacent to an open terrace so that when desired, and the weather and mosquitos permit, the beds can easily be moved out under the open sky.

Sunbathing. As it seems not unlikely that the vogue for sunbathing may increase rather than diminish in the future, provision should be made for this purpose. In warm weather the open roof terrace may be used conveniently where it can be cut off from the rest of the house and is not visible from other houses. To accomplish the latter result and to shut off any wind a curtain which can be pulled around the terrace is frequently used in European houses. In many cases it will be worthwhile to provide a special small room with a cot. This should be equipped with a window of sufficient size and so placed that the direct rays of the sun can enter and fall on the cot during the five or six hours in the middle of the day. The window can be glazed with an ultra-violet glass but this is not necessary as by providing heat it will probably be found possible to keep the window open at all times when the room is in use. The window should be so arranged that persons cannot see in, thus permitting the user to dispense with all clothing.

A more ambitious scheme for providing sun baths calls for a complete glass room to be built on the roof of standard conservatory construction and glazed with ultra-violet glass. Such an arrangement would be of special value as a children's playroom. Even where the owner is interested in having a conservatory for plants rather than for sun baths the roof offers many advantages as a location.

WATERPROOFING

Canvas. For week-end houses or small inexpensive residences a roof of canvas may be found satisfactory if kept well painted. In addition to being economical the material itself constitutes a suitable finished surface upon which to walk. Leaks can be easily repaired in the same manner as with a canoe.

Built-up asphalt roofing is used almost exclusively for flat decks at the present time, and if properly laid will be absolutely watertight and possess great durability. This type of roofing, however, must be covered with some kind of surfacing material as it presents an unattractive appearance and will not withstand much wear.

Auxiliary equipment. To permit the full enjoyment of roof porches or terraces a telephone outlet should be provided at the roof level. Also desirable, especially in connection with a roof sleeping porch, is a small lavatory containing a watercloset. An outdoor fireplace may prove a real pleasure on cool evenings in the fall or spring and will be especially attractive to children for the purpose of cooking picnic suppers. A dumbwaiter running from the basement to the roof might be worthwhile for supplying wood as well as for carrying refreshments. Where the same dumbwaiter is to be used for carrying both heavy and light loads it should be either electrically operated or of the two-speed variety.

Stairs. Access to the roof may be gained either by an interior or an exterior stairway. The latter may be cheaper to construct as no pent house will be required. The exterior stairway may start at the ground level, but where the building is two stories or higher exclusive of the roof this is not necessary, and may at times be objectionable in that the roof will have less feeling of privacy if directly accessible from the ground. Where exterior stairs do not connect with the ground access can be gained to them either directly from a door or indirectly from a second-floor porch or terrace.

An interior stairway, while requiring the construction of a pent house, offers several advantages. The connection between the interior of the house and the roof will be more intimate and the openness will be increased. If equipped with adequate doors and windows the pent house may serve as a source of light for the illumination of an interior hall or stairway, as well as acting as a giant ventilator for the entire house. To prevent excessive heat loss from these windows or doors during the winter they should be double-glazed. A sunny nook with overhanging roof, giving protection from the wind and rain, can be built in one side of the pent house and telephone, lavatory and sunbathing facilities may also be provided. Where economy is essential an interior stairway can be used with a hatch instead of a pent house. This should be of adequate size,

and for ease in opening and closing should be counter-balanced.

Where membrane roofing is used gutters should be avoided if possible and the entire roof surface sloped evenly towards the drains. Where the roof is supported on wooden joists or where there may be possibility of unequal settlement a pitch of not less than one quarter inch to the foot should be provided.

Special care should be taken where the roof meets the parapet wall.

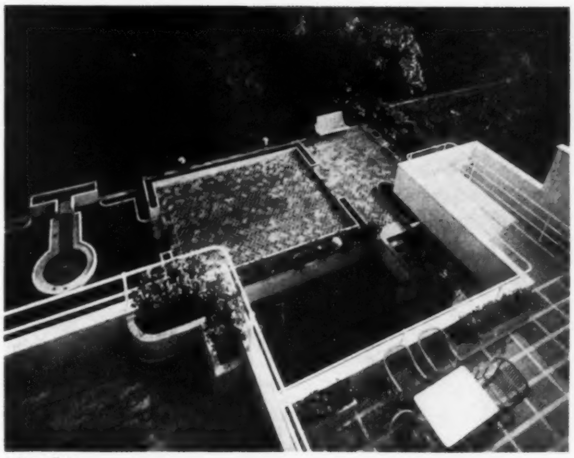
Where the parapet wall is of concrete, sheet metal counter-flashing should be imbedded permanently in the concrete at the time it is poured. The top of this counter-flashing should be high enough above the finished roof surface to prevent all possibility of melting snow seeping in above it. The membrane should be turned up at the wall and the base-flashing carried up to the point where the counter-flashing enters the wall. By carrying the metal counter-flashing all the way down over the base-flashing the latter is protected from mechanical injury.

Special care should be taken around chimneys. If an outside fireplace is provided the membrane should be run under the entire hearth and turned up at the back and at each side. The fire-brick lining can then be built in afterwards on top of this membrane. To prevent the heat of the fire from softening the membrane a sufficient thickness of brick should be provided. A fireplace of the Franklin stove variety might be provided in place of one built in the chimney. This could rest on a hearth placed over the membrane roof, and in addition to giving more heat would present no waterproofing difficulties.

Monolithic concrete. In a building of reinforced concrete construction it may be possible to make the structural roof itself watertight, thus eliminating the necessity of providing not only a separate roofing material but all flashing and counter-flashing as well. This result can be accomplished either by an integral waterproofing or by a waterproofing applied to the top surface of the concrete. In either case a sufficient amount of reinforcing should be used to prevent as far as possible the formation of cracks resulting either from unequal settlement or from temperature changes.

Welded metal. One of the major advantages of metal construction as applied to houses would be the ease with which an absolutely permanent watertight roof could be produced by merely welding the joints. The welded steel battledeck floor already in commercial use would constitute an almost perfect solution of the problem if used in connection with steel parapet walls or open metal railings. In addition to its permanence and economy of original cost no separate waterproofing or flashing would be required.

Scuppers. To take care of the possibility of the drains becoming clogged scuppers should be provided a few inches above the roof level.



Cahiers d'Art

VILLA AT NEUILLY, FRANCE
GABRIEL GUEVREKIAN, ARCHITECT

SURFACING THE ROOF

Elements to be considered. Where the roof is to be used for porch or terrace purposes its surface should be finished in such a way as to withstand footwear and be attractive in appearance. If it is to be used as a place for children to play the surface should also be resilient and of a type which will not absorb too much heat in the sun. It should be as permanent as possible, requiring a minimum of upkeep.

Canvas. If canvas is used as the roofing material no further surfacing is required other than paint.

Concrete. Where the construction is of reinforced concrete with integral waterproofing it is not necessary to provide any other surfacing material unless a more attractive appearance or a more resilient surface is desired. Where the waterproofing instead of being integral is applied to the surface it will probably be necessary to cover it in some way, at least with a layer of cement, in order to prevent damage from wear or mechanical injury.

Wooden slats. An inexpensive means of protecting a membrane roof and one which at the same time gives a surface suitable to walk upon is to construct a light flooring of wooden slats setting them a little apart so as to leave spaces through which the water can run. The flooring can be set level, the membrane having a sufficient pitch to assure proper drainage.

Earth with grass or flagging. Probably the simplest and cheapest method is merely to fill in a layer of earth, planting it with grass and flowers and paving it with flagging of some sort where desired. The thickness of fill required will depend on such considerations as the prevailing climate, the type of plants to be grown, etc. In addition to its economy this method has several distinct advantages. As the earth will have a certain insulating value, especially when it comes to keeping the house cool in summer, it will be possible to get along with less insulation

or even to eliminate it entirely as far as the roof is concerned. As the earth will remain damp and cool most of the time either from rain or from artificial sprinkling the life of the membrane roofing should be greatly lengthened. With the entire structural roof protected from extreme heat and cold there should be less trouble from expansion and contraction and as a result, where concrete is used, less danger of temperature cracks. If a leak should ever develop the removal of the earth where necessary would be an easy matter and one not involving skilled labor.

Flagging can be of stone or of some other material such as brick or tile. If stone is employed it can be either of the thick type such as is usually used for garden walks or of thin sheets of slate or soapstone, the latter having the advantage of lightness. Concrete slabs can be used for this purpose. To reduce the weight an aerated concrete or one made with light aggregates might be used.

Where flagging is used and it is not desired to grow grass or plants a thin fill of sand could be substituted for the earth. This would be found cleaner and less apt to spatter during rain. Whether it will be worthwhile to grow plants or flowers will probably depend largely upon the climate and the interests of the individual owner. Certainly flower beds should not be made an integral part of the architectural design unless the climate is such as to permit their being filled at least during a majority of the year.

An objection to the use of earth is that the roof will be damp after rains and so will not provide a dry place to sit. Also because grass, except in a very mild climate, will not present a satisfactory surface in winter and spring, the flagging should be set with fairly narrow joints. Under porches, especially if screened, it will not be advisable to attempt to grow grass or plants, a fill of sand probably being preferable to one of earth.

Gravel. Another solution employed frequently in Europe is merely to provide a thin layer of gravel. This can be of the round roofing variety, but a material, such as driveway screenings, which will interlock and compact solidly will be found more satisfactory.

Where a layer of porous material such as earth, sand or gravel is used there is probably no necessity for pitching the structural roof to the drains. The only objection to the dead level roof is that where not covered by such a material the slightest irregularity or unequal settlement may produce puddles in the low spots.

Tile. In many cases, especially for a covered or screened porch or where the winters constitute a considerable part of the year, the solution discussed above may not be entirely satisfactory or it may be desired to use a more finished material such as tile. Promenade tile, or slate in thin sheets, is frequently set on top of a membrane roof in hot mastic with mastic joints. This, however, will be found unsatisfactory, as during warm weather the mastic in the joints will become soft and will be tracked all over the roof and into the house. Where the tile is to be set in mastic the joints should be left open and filled later with Portland cement mortar. Every precaution should, however, be made to procure a solid bed of mastic under each tile as otherwise water may fill the voids, freeze and cause the tile to heave.

The tile could be set in a thick bed of mortar in the manner usual for interior work, but this is to be discouraged, especially in connection with a membrane roof, because of the great difficulty of making repairs in case a leak should occur. It is also claimed that tile set by this method is very subject to injury by frost. Wherever tile is set with solid joints, unless the area is relatively small, provision must be made for expansion as otherwise there is danger that the parapet walls may be pushed out or the tile heave. Material used in expansion joints should be such as will not easily be tracked about during hot weather.

Resilient flooring. Tile, while satisfactory in most respects, has the serious disadvantage where roof is to be used for play purposes that it is entirely unresilient. Most of the more resilient flooring materials available are unsuitable for exterior use. Ordinary interlocking rubber tile has however been used for this purpose and there is now available a special rubber tile* made for paving exterior sidewalks which is unusually resilient. Certain types of mastic floors might possibly be used. Zenitherm,** while less resilient, is, according to its manufacturers, able to withstand outside weather conditions. Although not resilient as compared with the above types of flooring, blocks of end-grain wood might be used if adequate provision could be made for expansion.

INSULATION

Type and installation. Where the construction is of reinforced concrete, cork board or some such, insulation can be applied to the under side of the concrete slab. If a filling of earth or sand is to be used over a membrane roof it might be possible to apply the insulation on top of the concrete, although in this position it will be found less effective than if placed on the inside. Where the roof rests on wooden joists the space between the joists can be filled with some form of loose insulation. Rockwool, though possibly subject to criticism when used in a vertical wall on account of the danger of settlement, may constitute a satisfactory and economical solution of the problem. Used on a flat surface any settlement which may occur will do no harm other than to reduce slightly the total insulating value.

* Manufactured by the Wright Rubber Products Company, Racine, Wisconsin.

** Manufactured by Zenitherm Co., Inc., Newark, New Jersey.

Amount of insulation. The real problem, however, is to decide not the type of insulation to use but the amount necessary to guarantee against overheating. There is at present an unfortunate lack of data on this phase of the subject, especially as applied to dwelling houses, which makes it extremely difficult to give any specific recommendations. Manufacturers of insulation all promise to keep your house cool on the hottest days by the application of their products, but it is difficult to take their recommendations seriously as the thickness of material specified to produce the desired result is frequently as little as ½ inch. The situation will, of course, be somewhat affected by the color of the roof surface, since the darker that color the more heat is absorbed. Consideration should also be given the heat conductivity of the individual insulating material used as there is considerable difference between the best and poorest of the materials now on the market. Where a filling of earth or sand is used on the roof the amount of insulation required would probably be very greatly reduced.

Upper roof. In addition to insulating the roof proper it is probably equally desirable to insulate the upper roof over any covered porches, as otherwise under a strong sun and with no breeze they may become objectionably hot. Four inches or less of rockwool could be used for this purpose with completely satisfactory results.

Conductor heads. For a foot or so around conductor heads, as well as under gutters if there are any, it is advisable to omit all insulation. In the winter time this will permit the heat from the house to escape and melt any snow or ice at these points which otherwise might interfere with the rapid run off of water.

PARAPETS AND RAILINGS

Where a railing is used it should be of a type which a child cannot climb. The railing or parapet should be high enough to prevent all possibility of any one ever falling over it, and high enough to discourage any person from carelessly sitting on it. At the same time it should not be any higher than necessary, especially if solid, as otherwise it will cut off the view of persons sitting on the roof. The proper height is probably in the neighborhood of 35 to 37 inches.

SOIL STACKS

One of the problems created by the use of the flat roof is how to handle soil stack vent pipes so as to be unobjectionable. Where it is at all possible to do so the best arrangement is to carry these vents up through the pent house and terminate them just above the pent house roof. If for any reason this cannot be accomplished vents can be carried up in a chimney, the pipes being built in at the time of construction. Where neither of the above solutions is possible, it will be necessary either to leave the pipe exposed, merely carrying it up six or seven feet.

WINDOWS

General considerations. With increase in size windows frequently become more difficult to operate, yet the difficulty of operating a few large windows is preferable to the inconvenience of opening and closing many small separate units. A few larger units give better light and tend less to cut up the wall spaces. Corner windows, giving a wider outlook and a more open effect, will be found attractive.

In general if windows are to open at all they should open as completely as possible. This is especially true of windows for bedrooms where natural ventilation is seldom adequate on hot nights. Where windows become very large and tend to fill the entire outside wall area 100% ventilation is no longer necessary or desirable.

Double-hung. While having the advantage of watertightness and ease of operation the double-hung window furnishes only 50% ventilation. Attempts have been made to cure this by providing pockets in the wall into which the sash can be lowered. The most unfortunate feature of this style of window is the cross bar, which interferes with vision glass. To provide unobstructed vision double-hung windows should be set at a height which will bring the bottoms of the cross bars not less than 6′ above the finished floor.

Casement. Although providing full ventilation the in-opening casement is hard to make watertight against a driving rain and is objectionable in that when the window is open the valves project into the room and interfere with the curtains.

Also providing full ventilation, but not subject to the above faults, the out-opening casement creates a difficult problem of screening. One of the advantages of this type of casement especially if built flush with the outside surface of the building is that the valves can be set to catch a breeze from any direction. The location of the window flush with the outside also gives more space to the interior and by providing a wider sill and more sun furnishes an excellent place

to grow house plants. An objection to this type of window is the inconvenience in closing, especially during rain when it is necessary for one's arm to get wet in order to reach the handle of the projecting valve. The latter objection can be eliminated and the closing operation simplified by the use of patented operating devices. Where windows of this type are used care should be taken to see that tight non-removable pins are provided in the hinges, as where bolts and nuts are used the window can be easily opened from the outside by merely using a wrench. Many manufacturers now furnish windows with fixed lights above the movable valves, or at the side. These, no longer supplying full ventilation, lack one of the principal advantages of casement windows.

Sliding. Employed extensively in Europe the horizontal sliding sash, while not providing full ventilation, is especially well adapted for use in long banks of windows.

There are a number of patented sash devices on the market especially suitable for long banks of windows. Screened on the inside these fold out and slide to each end of the window so as to give 100% ventilation.

French casements. Windows opening to the floor provide more complete and rapid ventilation than those with normal sill heights. This is especially valuable in a bedroom as it permits a more rapid cooling of the room upon going to bed. Where a large number of French windows are used in a living room it may be possible to open the room sufficiently to avoid any necessity for providing a sitting porch. The use of French windows will, however, give a far different psychological effect, a room equipped with them being more open and less private. Whether this will be desirable or not will depend largely upon the type of location in which the house is built. Used in connection with a house on a small suburban lot near the street they will probably be less attractive than with a house in the middle of large grounds in the country. Where French doors open out on to a terrace or balcony raised a story or more above the ground level, complete privacy and openness may be procured.

Windows opening to the floor, in addition to being of the casement type, may be of the sliding or sliding-folding variety. With the former it may be possible to slide the sash horizontally into pockets in the wall thus providing 100% ventilation. The latter is particularly adaptable to large window spaces. Where used between a room and a screened porch, the French windows themselves need not be screened and a simpler and more attractive result will be procured.

SPECIAL WINDOW INSTALLATIONS

Windows for growing plants. Where an owner may have a particular interest in growing house plants a special window should be provided for this purpose. This should face directly south if possible, but otherwise easterly rather than westerly, as the morning sun is preferable to the late afternoon sun. To furnish the greatest amount of sun the glass should be set flush with the outside wall or, better, project beyond the wall in the form of a bay. Overhead light is of great importance and where a bay is used glass may be provided not only at the sides, but also at the top. The glass may be double to prevent injury to the plants from cold. Heat and ventilation should be provided in such a way as to avoid scorching the plants or injuring them from cold drafts. This can probably best be accomplished by providing radiators and a small louvred opening through the wall under the plant bench and leaving a narrow space between the plant bench and the wall for the warmed fresh air to rise. An outlet should be provided at the upper part of the window for the air to escape. The bench itself should be arranged with drains so that the plants may be freely watered. Glass shelves may be fastened against the window for smaller plants.

Where it is desired to engage in more extensive indoor gardening than is possible with the above a small conservatory should be provided, together with a greenhouse in which to raise the plants for the conservatory. While these constitute separate units they should if possible have direct access from one to the other.

Bedroom windows. To eliminate the bother of having to get up to shut bedroom windows whenever it begins to rain and to provide ventilation during the rain some arrangement is desirable to permit windows to be left open without letting in the rain. Wide projecting eaves will, of course, accomplish this result, but where these are not provided it may be possible to construct a small hood over each window. If these should cut off some of the midsummer sun it would not be objectionable as long as they did not project far enough to keep out the sun in winter. Windows looking on to porches can always be left open during a storm and are especially desirable in a bedroom for this reason.

Certain of the standard casement windows contain sections above the main valves which are hinged at the top and open out. These may be used to provide ventilation during rain.

Ultra-violet glass. While the best glasses on the market for the purpose of transmitting the ultra-violet rays of sunlight may be worthwhile for the treatment of invalids in hospital solariums, the value of their *extended* use in residence windows is doubtful. A solarium glazed with special window glass or windows exposed to the direct sunlight are necessary in order to obtain beneficial results in preventing rickets and presumably for general therapeutic purposes. As a result, wherever it is possible, it is better to utilize the direct sunlight by the use of an open solarium or by getting out of doors with as few clothes on as possible. A few minutes in direct sunlight at noon may be worth more than

hours sitting indoors behind a window. For a complete discussion of this subject and for data on the different glasses now on the market see Bureau of Standards' Research Paper No. 113, entitled "Data on Ultra-Violet Solar Radiation and the Solarization of Window Materials".

Double-glazing. See discussion under "Humidification". Double-glazing will be especially desirable back of window seats as a means of preventing drafts and reducing the cold from the window.

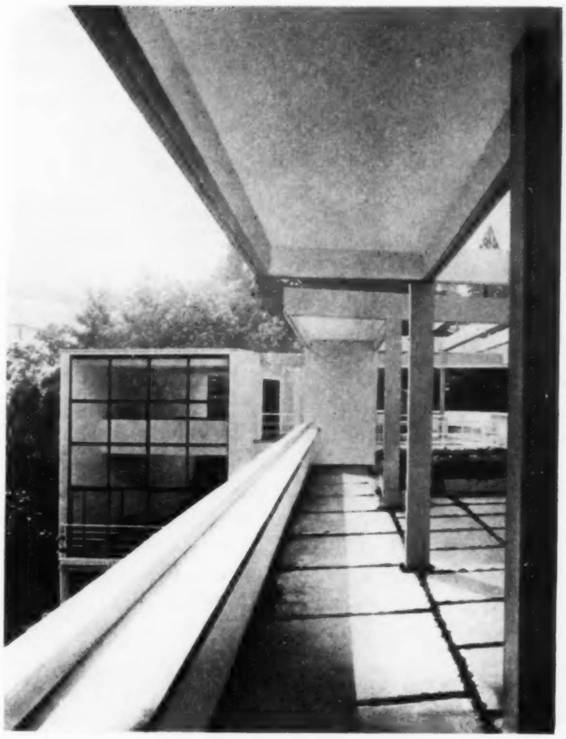
Shutters. Where it is anticipated that a house will be left unoccupied at frequent intervals, built-in steel rolling shutters may be installed over all windows to discourage burglary. Windows of the detention type originally developed for hospitals might be used where there is fear of burglary.

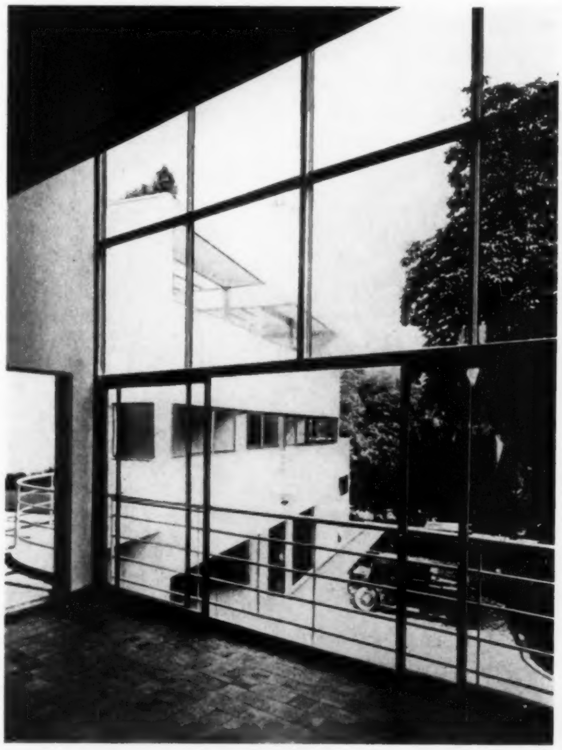
FIXED WINDOWS

Since the science of ventilation was first developed there has been talk of the possibility of employing fixed windows, sealed permanently in place at the time the building was erected and never to be opened. While such an arrangement would preclude, to quote from Lewis Mumford, "any human pleasure that may come from the gesture of throwing wide the window and taking in a breath of purer or cooler air" the idea as applied to house design is not without very considerable merit. In order to get his "breath of purer or cooler air" the occupant will have to step out on to the porch or terrace or turn on the ventilating system. The pleasure of "throwing wide the window", if that operation in itself may be described as a pleasure, he will have to forego, but in its place he will receive more significant if less sentimental benefits. Windows will be preserved not to be opened but to be looked through and to provide light during the day.

Economy. The saving in initial cost through the substitution of fixed sheets of glass for movable windows would be very considerable. In place of sash, frame, glass, pulleys, sash cords, window weights, hinges, handles, locks, screens, screen hardware, weather-stripping, etc., there would be simply a plain piece of glass and a light frame of the type used in store front work. The labor involved in setting single sheets of glass in permanent frames would be very much less than that of fitting and adjusting each one of the movable windows in a residence and of applying the hardware. The advantages of double-glazing could be provided more effectively at far less cost and with less inconvenience than would be possible with movable windows. With fixed windows sealed tightly in place there would be a minimum of air leakage with a resulting economy of fuel.

Better air conditions. Where the outside atmosphere may contain soot, dirt or dust or when the weather is hot the "purer and cooler air" will be gained not by throwing wide the window but by leaving it





HOUSE AT VILLE D'AVRAY
LE CORBUSIER AND P. JEANNERET
ARCHITECTS

tightly shut. By proper filtering, all dirt together with hay-fever-producing pollen may be excluded from the house with an increase in comfort and a decrease in cleaning, redecorating and even personal laundry bills. With tightly sealed windows and double-glazing, cooling in summer will be found economically possible and through the reduction of air infiltration a higher and more uniform humidity could be maintained in winter without the nuisance of condensation.

For sleeping purposes either a regular outdoor sleeping porch could be used or else an artificially ventilated bedroom. The latter, in addition to having the advantages mentioned above, would enjoy a uniform controlled night temperature and a positive air movement on warm nights when otherwise, with natural ventilation through open screened windows, there might not be a breath of air stirring. One of the greatest merits of this arrangement would be the complete exclusion of all outside noises. In fact for a residence in a noisy location, such as in the city, near railroad tracks or on an automobile highway, this might constitute its greatest single advantage.

In case of possible mechanical failure of the ventilating system the doors on to porches, etc., would provide sufficient air.

Other advantages. Curved glass could also be used more extensively. The view will be unobstructed by screens or by the necessity of providing frequent dividing bars. Screens will not have to be stored or taken down and put up every year. It will not be necessary to run and shut windows whenever it begins to rain and there will be no damage from water or snow to interior furnishings through carelessness in leaving windows open. Burglary will be discouraged as the windows will not be left open and cannot be jimmied.

INSECT SCREENS

Outside. Screens can be placed on the outside with those types of windows that do not project when open. Outside screens constitute the least inconvenience as having once been put up in the spring they do not have to be touched until they are taken down in the fall. Although with double-hung windows full length screens are not necessary, their use permits the window to be opened at both the top and bottom thus providing better ventilation.

Inside. Where the screens must be placed on the inside they should open and close easily to permit the operation of the window, although where operating devices are installed this is, of course, unnecessary. Inside screens are of three types: hinged, sliding (vertically or horizontally), and roll-up. Screens of the roll-up variety while not always operating with the utmost ease have the advantages that they do not have to be taken down and put up yearly and that wherever a window is closed the screen can be rolled up out of the way where it does not have to be looked through. Hinged and sliding screens have the advantage that when they are taken down in the fall inner storm windows can be putup in theirplace.

Manufacturers of casement windows realizing the disadvantage under which their product is laboring have recently undertaken to solve the screen problem and some very interesting results have been produced. It is now possible to buy from the same manufacturer both the window itself and the screen design to go with it.

HEATING AND AIR CONDITIONING

Probably the most difficult technical problem with which the architect is faced in residential work is how to produce the best year-round "weather" within his houses.

CENTRALIZED DUCT SYSTEM: WARM-AIR FURNACE

After a period of disrepute the "hot air" heating system of a generation ago is now returning to favor under a significant change in name. With the air circulated at a lower temperature and in greater volume, with more adequate cold air returns, with better designed duct work and the assistance of electric fans to warm more distant or exposed parts of the house and with proper arrangements for humidification, its old faults have been removed or even converted into virtues.

Advantages. These are many. In addition to the fact that the air while circulating through the system can easily be humidified to any desired point, it can also be filtered, ozonized if desired, and cooled and de-humidified in summer. No radiators are needed. As the system contains no water it cannot freeze and does not need to be drained whenever the house is left in cold weather, an especial advantage in a week-end house or a house frequently left empty during the winter. Also of advantage, particularly in a week-end house, is the fact that heat will be delivered to the rooms within a few minutes after the furnace is fired. The absence of drag when a register is turned off as well as when it is turned on

Padilla Studios

WEEK-END HOUSE OF JOHN BURNHAM
PALM SPRINGS, CALIF.
PALMER H. SABIN, ARCHITECT

is of especial advantage in a bedroom as it permits the room to be cooled quickly on retiring and warmed quickly on arising. The warm-air system also produces a more healthful air motion and the air is circulated through the entire house instead of being continually recirculating within a given room where it may become stale.

Disadvantages. One objection to the system at present is that where an oil burner or fan is used the ducts act as speaking tubes to carry the noise throughout the house. This objection can, however, be largely eliminated by the proper installation of a quiet type of burner or fan and by offsetting the ducts and lining them for a short distance with hair felt. Another objection frequently raised is the danger, especially where oil burners are used, that the combustion gases may leak through the joints of the furnace and thus be introduced directly into the house. On this account it is advisable to choose a furnace with as few joints as possible and to inspect the joints yearly after installation.

Gravity system. The air in a warm-air system is circulated either by gravity or by a fan, or by a combination of the two. Where a house is small and compact and the furnace can be located in the center of the basement, thus permitting short runs, the gravity method may be found entirely satisfactory. Some valuable research into the working of this type of system has recently been done by the University of Illinois, in cooperation with the National Warm-Air Heating and Ventilating Association, at its Research Residence in Urbana. The results of these experiments are available in the form of bulletins.

Combination system. Where for any reason the natural flow of air by gravity is insufficient to heat all of the house adequately the system may be supplemented by the installation of a booster fan. This can be operated by a switch or, where automatic heat is used, it can be wired in series with the burner. By-pass shutters are provided which open and close automatically so that the air placed in motion by the fan can continue to circulate by gravity. These shutters can be operated by direct mechanical means or by the air pressure produced when the fan starts. In either case quietness of operation is essential. If filters are used the shutters should be so arranged as to by-pass the air around them except when the fan is running.

Forced-air system. It is now customary to ignore gravity flow entirely where automatic heat is to be employed and to design the system for forced-air circulation. This has several advantages. Heat is produced throughout the house more uniformly, more positively and more quickly. Ducts may be smaller and greater freedom permitted in their location. It is even possible with a forced warm-air system to locate the furnace on the first floor, thus eliminating the necessity for a basement. Where open metal joist construction is used the space between the ceiling of the first story and the floor of the second story could be used as a duct to carry the warm air to all the rooms.

Where a fan is employed a slight cooling effect due to the movement of the air can be produced by its operation during hot summer weather, but without the addition of water sprays or mechanical refrigeration no great benefit should be anticipated from this source.

Outside vs. recirculated air. Much argument has been devoted to the relative merits of recirculating the air within the house or of introducing outside air. At the present time with houses built so loosely as to permit a constant and steady air change even with all the windows shut, there is probably no real advantage in the introduction of any outside air, and

to introduce more than a small percentage will be found highly extravagant of fuel. In the future, however, with the construction of air-tight walls and closer fitting windows the introduction of fresh air will probably be a necessity, and the ease of its introduction with this system will probably constitute one of its greatest merits.

Cold-air returns. Where recirculation is used adequate cold-air return ducts are of the first importance. In a very small house one large centrally located return may be adequate, but it is usually desirable, especially in large houses, to provide a separate return from each of the principal rooms. Every room the door of which may be periodically kept closed should have a separate return. Where returns are provided in bedrooms the cold-air register faces should be equipped with shutters in the same manner as the hot-air faces so that they may be closed at night when the windows are open in order to prevent the cold air from being drawn into the system and cooling off the house. No returns should ever be installed in such rooms as the kitchen or garage as it is undesirable to circulate their odors through the house. In the case of a garage there may be the further danger of drawing gasoline fumes into the system with a possible resulting explosion. In order to provide an adequate flow of warm air to such rooms they should be vented outdoors, either by a sheet metal duct or by a chimney flue installed for that purpose. Where a separate exhaust fan is used, as in a kitchen, it can be connected to this vent.

*Combination unit.** There has recently been put on the market an interesting device combining in one unit all of the apparatus necessary for a successful forced-air heating system: a gas-burning, warm-air furnace, a humidifier, a viscous oil filter, a blower, and full automatic controls. At present the manufacturers are working on a summer cooling unit to be added to the above as soon as perfected.

CENTRALIZED DUCT SYSTEM: RADIATORS

A centralized duct system essentially similar to the above can be used employing radiators instead of the actual outside surface of the furnace to heat the air.

Advantages. This arrangement, while sharing in almost all the merits of the direct warm-air system, has several further advantages. By the use of a boiler instead of a furnace the domestic hot water supply can be automatically heated the year round. A greater freedom is allowed in the arrangement of equipment as the boiler can be placed in one part of the basement and the ducts and radiators in another. This separation of the air from direct contact with the furnace will eliminate all possibility of danger from escaping combustion gases as well as reduce the noise resulting from oil-burner equipment. In a large house the ducts need not all be brought to one point, but several different heating centers can be established, perhaps controlled by different thermostats. This, however, should not be carried too far as most of the advantages of a centralized duct system may be lost.

One of the greatest merits of this arrangement is that direct radiators can be used to supplement the duct system wherever it seems desirable, as for example in remote rooms to which it may be difficult to carry ducts, in rooms subjected to an unusually severe exposure, or in special rooms such as garages and kitchens where humidity is not needed and from which it is not desirable to recirculate air.

Disadvantage. The cost will usually be much more than where a furnace is used. This may be somewhat compensated for by the fact that a separate hot water heater is not required.

RADIATOR SYSTEM: DIRECT OR SEMI-INDIRECT

Exposed radiator—unclean, objectionable in looks, and consuming of floor space—and the lack of humidification have probably constituted the two most serious objections to the radiator system of heating. The former can now largely be removed by the use of the new compact sheet metal radiators specially made to be built in the wall, and the latter by installation of a sufficient number of adequate unit humidifiers. Exposed radiators are to be avoided especially in bathrooms where an unclothed person may bump against them and get burned. Where there is insufficient space to build in a bathroom radiator or the expense is objectionable there can be procured a special sheet metal radiator small enough in size to go under the lavatory where it is out of the way. As this type of radiator is placed off the floor it is easy to clean underneath.

Steam and vapor. A steam system is the cheapest to install as the radiators are small and only one pipe to each radiator is required. The temperature of the radiators is, however, extremely hot and may constitute a serious danger with children if left exposed. Vapor requires slightly larger radiators than steam, but they are not quite so hot. The output of heat from a vapor radiator can be more accurately controlled by the valve than with either steam or hot water. Both steam and vapor have the advantage over hot water that the domestic hot water supply can always be automatically heated without the expense and complication of motor valves.

Hot water. If hot water heat is used, considerably larger radiators will be required but they will seldom be dangerously hot. While hot water heat may produce a more uniform radiator temperature it has a very considerable drag, being both slow to heat up and slow to cool off, a quality highly objectionable in bedroom radiators. With a thermostatically con-

* Manufactured by the Carrier-Lyle Corporation of Newark, New Jersey.

trolled system this drag may also be the cause of uncomfortable overheating when a warm morning, as in spring or fall, follows a cold night. Just before the sun rises the thermostat may call for heat. A few hours later, with the sun up and all the radiators full of hot water, the temperature of the house may rise as high as 75° or even 80°.

In order to reduce this drag and produce more rapid circulation, thus requiring a smaller boiler and smaller pipes and radiators, it is now not uncommon to use a small auxiliary pump in the same way that an auxiliary fan is used in a warm-air system. As with a warm-air system it is also possible by this means to locate the boiler on the first floor and thus completely do without a basement.

PANEL HEATING SYSTEM

There has recently been developed in England, and now first introduced into this country in the British Embassy in Washington, a new type of patented heating system consisting of concealed hot water pipes placed in the ceiling.* While originally developed as the result of a desire to eliminate exposed radiators and grills it was subsequently discovered that radically new heating principles were involved offering decided advantages.

Principle of operation. The basic arrangement is in all essentials similar to a regular hot water heating system except that, instead of exposed or concealed radiators, coils with welded joints and tested under high pressure are placed in the ceiling just above its lower surface and buried in the plaster, which is of a special type to prevent cracking. Hot water is circulated at a relatively low temperature either by gravity or by pump. By means of these coils the plaster is raised in temperature to a point where the heat radiated from its lower surface is sufficient to warm the room to the desired point. However, as the air cannot be warmed by convection, owing to the location of the source of heat at the top of the room, and as radiant heat does not appreciably warm the air through which it passes, the air in the room is left at a relatively low temperature. The comfort of the occupants does not depend primarily on the warmth of the air but on the heat radiated by the ceiling, in the same way that a person sitting in a protected sunny spot on a cold winter day may be adequately warmed by the radiant heat of the sun although the air may be very cold. The inventors claim that a room heated by the panel system will be entirely comfortable with the air at a temperature of only 62°, and further that with the air heated above that point a sensation of serious overheating will be experienced.** The recent work of the New York State Commission on Ventilation has shown the dangers to health of overheating, and the importance of a matter of even two or three degrees. This commission recommends that the air temperature be maintained as low as is consistent with comfort, and panel heating may provide a means for comfort at a temperature far below that possible with any other system of heating.

* Richard Crittall & Co., Ltd., of London, control the patents; Wolff & Munier, Inc., 222 East 41st Street, New York, are American agents.

PANEL HEATING CONSTRUCTION
BRITISH EMBASSY, WASHINGTON

At the present time, however, the development of the system is still in its infancy and there are many questions yet to be answered. For example, just how is such radiant heat to be thermostatically controlled, and how is the temperature of the air to be properly correlated with the amount of radiant heat? How is a desirable air motion to be procured when there are no convection currents?

Results of employing radiant heat. A most interesting feature of the system is told in the following

** The humidity conditions accompanying these temperatures are not given in their statement.

quotation taken from the test data made in connection with the British Embassy installation:

> "One notable detail of these tests was that the air in the rooms tested felt slightly cooler when one walked briskly through the room than when standing still—a result entirely consistent with the theory that the comfort experienced in the relatively cool air was due to the direct 'pick-up' of radiant heat by the body and clothes. Brisk movement does not change the amount of radiant heat picked up; but by creating an appreciable velocity of the relatively cool air in contact with the body, it somewhat increases the absorption of heat from the body. This should partly counteract the common tendency to become overheated by dancing, or by any other exertion, which is so noticeable in rooms heated by the ordinary methods; and should be a distinct factor in creating additional comfort for those so occupied, when in panel-heated rooms. It is a well-known physiological fact, that slight variations in the effective temperature to which the body is subjected have a tonic and stimulating effect; and this result of panel heating will provide such an effect just at the time (when exerting oneself) it is most valuable. Conversely, whereas with the ordinary heating system one who has been exerting himself may feel chilly upon sitting down or lying down, with panel heating, as soon as he is still, it will appear as though the air temperature had been slightly increased."

It is probable that owing to the ever-present radiant heat and the lower required air temperature it will be possible with this system to have the windows open much more than at present, not only in the spring and fall but during colder weather as well.

As ordinarily installed insulation is applied above the coils so as to avoid overheating the floor surfaces directly above. In the case of bathroom floors, especially if tile, this insulation could well be omitted, thus permitting them to be heated so as to be comfortable to the bare feet.

Possible development. Suggested by the panel system is the possibility of covering the entire ceiling with exposed heated electric elements. These could be of the heat-producing type used in infra-red lamps or, if desired, light and perhaps even ultra-violet rays could be given off as well. The radiant heat from such elements would be so much greater than that produced by the surface of the ceiling in the panel system that it might be possible to maintain very low air temperatures or even completely to disregard the temperature of the air. One advantage of this system would be that if there were means provided to prevent the water pipes from freezing the heat in a room would never have to be turned on unless the room was occupied.

FUELS

COAL

With the development of small mechanical stokers adaptable to domestic use, certain advantages of automatically controlled heat are now possible even with coal. These stokers are designed to burn both hard and soft coal screenings; where hard coal is used the ashes are automatically removed and deposited in a can, and where soft coal is used clinkers are formed which must be removed by hand.

Disadvantages. In addition to the inconvenience of having manually to fill the hopper of the machine and dispose of clinkers or ashes the coal stoker has the disadvantage as compared with other forms of mechanically controlled heat that it cannot start and stop itself. Having once been started it will run until turned off and then with the return of cold weather must be started again, a situation which may constitute a serious inconvenience during the spring and fall. However, if used in connection with an automatic year-round domestic hot water heating system, this objection would be completely eliminated as the stoker would then be kept in constant operation. It might also be possible to eliminate the manual filling of the hopper by providing a coal bin in such a way as to feed into the hopper by gravity.

Advantages. The coal stoker has the advantage that it produces no odors or oily soot, and that there is no danger of explosion.

OIL

Advantages. The greatest advantage of oil heat is probably not its convenience or possible economy but that it is fully automatic, thus insuring a constant temperature in the house at all times—fall, winter and spring—regardless of the greatest and most sudden outside temperature change. In addition, it does not require more than periodic attention, perhaps running an entire season with nothing more than a few oilings. No basement storage space for fuel is required.

Disadvantages. In addition to the possibility of odors, soot and danger from fire, the major objection to oil heat has been the considerable noise usually produced. This is the result of two different causes, the mechanical operation of the burner itself and the combustion of the oil in the fire box. The latter varies with the type of flame produced. The former is usually more apt to be objectionable where the burner is attached directly to the boiler, thus permitting the noise to be conducted through the house by means of the heating pipes. Where possible the boiler should be located under the service portion of the house rather than under the living or dining rooms. If the burner is of a type that can be mounted on a sound-deadening pad on the concrete floor, then the entire boiler and burner could be enclosed in a small room with sound-proof walls and ceiling. If

the sound-proofing used is good for heat insulation as well, it will also serve to confine what heat may be produced by the summer operation of the boiler in connection with the domestic hot water supply. Such a small furnace room would have the further advantage of preventing the spread of any odors resulting from the use of oil. In this connection special attention should be called to the necessity of providing a small air inlet to furnish the air needed for combustion. The lack of air is a common cause of trouble with oil burners and even where the boiler is placed in a large basement it would be well to provide a small opening in the outside wall which would always remain open.

Boilers. With the introduction of oil burners, special boilers have been designed to operate more efficiently with this type of heat. As the shape and type of flame as well as the basic method of operation may vary greatly with different makes of oil burners the general type at least should be decided upon before specifying a boiler.

Low water cut-off. If steam or vapor heat is used it is good insurance against a burnt-out boiler to specify a low water cut-off connected into the electric line to the burner.

GAS

Advantages. Although fairly expensive in many parts of the country gas is certainly the most convenient fuel in common use today. In addition to having all the advantages of oil, it is relatively noiseless and it is not necessary to order fuel. The total initial cost will be less as no storage tank is required and as the burner and boiler usually constitute a combined unit. It is not necessary to provide a driveway capable of withstanding heavy trucks, and the boiler or furnace can be placed in any part of the house most convenient without regard to the fuel supply.

Unit system. An interesting system of gas heating, consisting of individual units and permitting separate thermostatic control of each room, has recently been put on the market.* In each room is placed a radiator inside of which gas is burned. The products of combustion pass through the different sections of the radiator, are drawn off through a small pipe by an exhaust fan and finally expelled to the air either through a chimney or a pipe. A partial vacuum is maintained by the fan within the radiator and exhaust line, and an automatic switch is so arranged that if the vacuum is ever broken, through a leak or through failure of the fan, all the burners are shut off.

* Manufactured by the Roberts-Jordan Appliance Corporation, Curtis Building, Buffalo.

ELECTRICITY

Advantages. Electricity has the advantage over gas and oil that it is absolutely clean and noiseless, and that by its use in conjunction with an electric cooking stove all open flames may be avoided, thus reducing the fire hazard to a minimum. By its use it is even possible completely to do without any chimney, a fact which may in the future give it a certain economic advantage where initial building costs must be kept at a minimum.

Off-peak storage system. The most economical system of using electricity is that by which heat is stored in water during the night and then the hot water is circulated through radiators during the day time. This system is fully automatic in operation and has been used successfully in Europe for some years.** But even though it takes advantage of low off-peak night rates it will probably only be found possible where electricity can be procured at a cost not exceeding one cent per kilowatt-hour. Even at this price its use may be quite expensive and thorough insulation of the entire house, including the basement, and double-glazing as well, would probably be advisable.

Unit system. Where the day rates on electricity are not too high individual units may be placed in each room, consisting of heated elements exposed directly to the air. This arrangement has the advantage that each room can be controlled independently of every other room, and that no room need be heated except when occupied. An additional possible method for heating directly by electricity is suggested at the end of the discussion on the panel heating system.

AUTOMATIC CONTROLS

Advantages. The greatest single improvement in heating methods that has been developed during the last generation is the introduction of automatic controls. They make possible the maintenance of a uniform house temperature regardless of weather changes. The value of this is greatest in both comfort and economy not during the coldest winter weather, but during the spring and fall when the outside temperature fluctuations are most extreme, sudden and irregular.

Variability of heat. While it is highly desirable to prevent underheating and especially overheating common with any manually controlled system it is at the same time not necessary to try to keep the temperature absolutely uniform. A certain fluctuation about a predetermined point is probably beneficial as is indicated by Dr. Ellsworth Huntington's statement that "a variable climate is in general much more healthful than a uniform climate even though

** It is being developed in this country by the Hall Electric Company, Inc., 1429 Walnut Street, Philadelphia, Pa.

the latter has an almost ideal temperature". Most thermostats have a differential of only one or two degrees Fahrenheit. It might well be desirable to increase this differential to three or four degrees, thus not only introducing a more healthful variation into the extreme monotony of present-day heating but also causing the burner, while running longer each time, to operate less frequently. Under the present system of controlled heating what fluctuations exist usually are the result of poor distribution and while perhaps not objectionable to a person moving about result only in discomfort to a person sitting or working in one place.

Location of thermostat. Where only one thermostat is employed to control an entire house its location is of great importance and every effort should be made to design as carefully a balanced heating system as possible. The thermostat should not be located in the front hall where cold air may blow on it and turn on the heat everytime the front door is opened. Neither should it be located in any room with a used fireplace as the heat from the fire will shut off the thermostat regardless of how great the need for heat may be in the rest of the house. The thermostat should be located in as typical a part of the house as possible and not near radiators or registers, or on an outside wall. It should also never be placed on a wall near concealed air ducts or water pipes. The predetermining of the best location may be very difficult and it is now possible to provide at the time of building several electric outlets in different parts of the house. A portable thermostat of a type made to rest on a table or bookcase may then be used where conditions prove best. Such a thermostat placed in the center of a room may give better results than one permanently attached to the wall and also be less objectionable in appearance.

Clock thermostats. There is considerable question as to the advisability of employing clock thermostats by the use of which it is possible to maintain a lower night temperature. Whether it is better to keep the house warm all night or to let it get cold and then warm it up in the morning may depend on the type of heating used. While a theoretical saving in fuel may result from this system it is apt to be somewhat of a nuisance and its operation may be neglected by the owner even where an 8-day clock is used. If the saving in fuel is worthwhile at all it is probably worth the slight extra cost necessary to install a fully automatic system controlled by an electric clock. Where the owner desires to raise potted plants in a house the possible effect of a lower night temperature should be considered.

Suggestions for more extended use of controls. In spite of the improvement in heating that has been made possible by automatic controls and regulating devices, their use in residential work is still very limited and the possibilities resulting from their more extended application are only beginning to be appreciated. Various parts of a house subject to different exposures and used for different purposes may be advantageously controlled by separate thermostats especially if the heating system is of a type which permits this to be easily accomplished. The average private garage, for example, unless used as a workshop need never be heated more than just above freezing. This temperature can be accurately maintained by a thermostat, but to depend on the hand-control of valves may only result in frozen water pipes during some cold snap.

Control of night temperature in bedrooms. The bedroom presents a heretofore unexplored field for the application of controlled heat. It has been suggested that as most bedrooms in the average house remain unoccupied during much of the day they be left unheated when not in use but equipped with some form of electric or other heat which will permit their being brought very rapidly to the required temperature when needed. While such a system, if ever worked out, may have the advantage of economy of operation, the question of the proper control of the night temperature of bedrooms seems to be far more important in that it effects both comfort and health. While many persons may be able to sleep night after night with unfailing comfort in the middle of winter under the present system by which the heat is turned off and the windows are opened, there are many others who, while wishing to enjoy all the advantages of fresh moving air and a low temperature, are continually troubled with the cold. This situation is due not to the intensity of the cold but to the extreme variation of temperature. If a bedroom in winter were approximately the same temperature all night and every night no matter how low that temperature might be a sleeper by the use of more or heavier blankets could adjust himself to the existing conditions and be entirely comfortable. As a matter of fact, however, there is the greatest possible variation from night to night as well as during each night. At the time of undressing and going to bed the room will probably be about 70° and although the sleeper turns off the radiator and opens the window it may take several hours before the room has completely cooled off, the exact time depending on the amount of cross draft and the type of heat used. A hot water radiator will frequently stay hot for several hours. If the sleeper covers himself with only enough blankets to be comfortable during the early part of the night he will be cold later, or, what is equally bad, if he uses enough blankets to be warm later he will be too hot to begin with. Even when, with the help of a good cross draft and a form of heat that can be completely shut off, the room can be at once cooled to the desired point, there is still the nightly fluctuations in the outdoor temperature and the even greater unpredictable variation from night to night.

The problem can probably be completely solved

by the proper use of thermostatic controls. Each bedroom should be equipped with a clock thermostat with a range from about 30° to 70°. This thermostat would control the source of heat to the room by an electric valve, if the heating was by radiation, or by an electrically operated damper, if by warm air. At bedtime, the thermostat would be set for the desired night temperature, a temperature at which the sleeper knows he will be entirely comfortable with a certain number of blankets, and the window would be opened an amount varying with outside conditions. The thermostat will turn the heat on and off during the night so as to maintain approximately the desired temperature. A short while before it is time to get up, the clock on the thermostat will raise the setting to 70° and there will be heat ready in the radiators to warm the room quickly when the window is shut. (Incidentally, the window can also be closed automatically at the same time the heat comes on, by a small device now on the market at a low price.)

FAILURE OF HEATING PLANT

With a mechanically operated heating plant the possibility of its failure may present an important problem, especially where the climate is severe, the electric service is subject to failure, or the location of the building is remote.

Precautions. If an oil burner is to be used the reliability of the local repair service is of the utmost importance. To provide against emergencies where a house is being built in a remote location or where unusually heavy snows are common, there should be specified an extra large storage tank for oil. Further to prevent the possibility of running out of oil a gauge should be provided, placed in a regularly used part of the house where it will frequently be seen. Many oil burners at present require the use of gas as well as of oil and electricity. Where there is no gas or the gas supply is apt to fail, a burner can be procured which will start with an electric spark.

The necessary electric controls for a gas system may be operated in an emergency by a storage battery kept automatically charged by the current when on.

In case of failure. But in spite of precautions a failure is always possible. In such an emergency fireplaces may be of slight value in keeping the house warm. In most present-day dwellings fireplaces are only provided as an unnecessary luxury in a few of the most important rooms and so are inadequate to prevent the freezing of water pipes in the more distant parts of the house. A few small portable oil heaters if kept on hand might be used to supplement the fireplaces.

The double-duty boiler provides one definite solution to the problem. This type of boiler has two fire boxes, one at each end of the boiler, and each with a separate door. The larger of the fire boxes is used for the oil burner and the smaller as a garbage incinerator. The latter is equipped with grates and during an emergency either coal, a small supply of which may be kept on hand for this purpose, or fireplace wood may be conveniently burned in it, thus keeping the house warm. Certain oil burners are arranged in such a way that they can be removed and temporary grates used during an emergency. While perhaps possible as a last resort, such an arrangement should not be counted upon in a location where the necessary electric supply is subject to failure.

HUMIDIFICATION

Humidity as important as temperature. Humidification presents a problem inseparably connected with heating, yet a problem almost completely disregarded in house design until within the last few years, and still insufficiently studied. The effect of the air is dependent as much on humidity as temperature. The recent work of the American Society of Heating and Ventilating Engineers done in conjunction with the United States Public Health Service and United States Bureau of Mines has clearly demonstrated that as far as sensations of warmness and coolness are concerned it is immaterial whether the temperature is, for example, 74° with a humidity of 20% or 66° with a humidity of 80%. There is, however, a very considerable difference in the comfort, healthfulness and cost of these two conditions.

Healthfulness. That the lower temperature, made possible by the higher humidity, is more desirable from the health point of view is indicated by the work of the New York State Commission on Ventilation. Experiments conducted in school rooms over a period of two years tend to show that a rise of only two degrees in temperature, from 66.5° to 68.5°, was responsible for an 18% increase in absences due to respiratory sickness and a 70% increase in respiratory sickness among pupils in attendance. In the opinion of this committee the maintenance of low temperatures is by far the most important problem of ventilation. Low temperatures are made comfortable by a high humidity. That a high humidity is in itself healthful has been demonstrated by the exhaustive study of Professor Ellsworth Huntington of Yale. As a result of a careful analysis of weather reports in relation to sixty million deaths in all parts of the world, Dr. Huntington was able to show that a humidity of 80% is associated with a minimum

general death rate and that a higher or lower humidity was accompanied by an increase in mortality. Factory work was also shown to be more efficient at a high humidity, and in studying deviations from the normal for any given month a high humidity produced more favorable conditions unless accompanied by an abnormally high temperature.

Comfort. That a low temperature with a high humidity is far more comfortable than a high temperture with low humidity is obvious. Air of low humidity absorbs moisture from the skin and mucous membrane of the nose and throat producing a dried-out sensation usually accompanied with a nervous keyed-up condition. Cool air with a high humidity on the other hand will have a pleasant freshness producing a sensation similar to that of the outside atmosphere of spring and fall.

Cost. From the point of view of cost it is obviously more economical to heat a building to 66° than it is to heat it to 74°. This, however, cannot be considered as an entirely clear gain, since the process of humidification involves certain initial costs as well as operating expenses.

Present conditions. In connection with Dr. Huntington's recommendation of 80% relative humidity, it is interesting to note the conditions normally existing in unhumidified houses in the middle of winter at the present time. The average probably falls between 20 and 25%, frequently dropping as low as 15% and seldom reaching 30%. This is even lower than the 33% average for the Sahara desert and considerably lower than the 44% average for the Colorado desert. Houses humidified with the usual type of humidifier now on the market will probably not average over 45% and many of them will fall even below that point.

CONDENSATION

The one great inconvenience accompanying a high humidity, and probably the greatest single obstacle to its more universal acceptance, is condensation. With well-insulated walls, however, condensation will occur only on the windows, where it can be taken care of, or even largely eliminated except during the coldest weather.

Remedies: condensation gutters, double glazing. There is nothing inherently objectionable to condensation. In fact, to those persons who appreciate the comfort of a high humidity its presence is a pleasing indication that there is probably at least a fair amount of moisture in the atmosphere. Condensation is, however, the cause of two just complaints: windows covered with condensation cannot be seen through, and when the surplus moisture of condensation runs down off the glass it forms pools of water on the sills which may stain the curtains and walls. The latter objection can be entirely removed by the provision of adequate condensation gutters to carry off this water. Both objections can be reduced to a minimum by the use of double glazing. In addition to largely preventing condensation this has the further advantage that it reduces the total air infiltration and heat loss from the building,* thus saving fuel. Charts prepared by the University of Illinois show that with an inside temperature of 69° and a humidity of 60% condensation will occur on single glass when the outside temperature is only 48 degrees, but will not occur on double glass until the temperature is as low as 19 degrees. Or, expressing this differently, with an outside temperature of 20° condensation will occur on single glass when the humidity reaches 30%, but will not occur on double glass until it reaches 60% Even with zero weather outside double glazing will permit a humidity of approximately 50% unaccompanied by any condensation whatever. The ultimate solution to the problem of condensation as well as heat loss may be found in the vacuumized window pane.

Double glazing can be accomplished in a variety of ways, but the most important requirement is airtightness. Both sheets of glass may be set permanently in the same frame, but in this case the glazing should be done during weather as dry as possible. For greatest efficiency the air space between the glass should not be less than one inch in thickness. Even if the glazing is relatively airtight, dirt will eventually filter in and the glass will require cleaning, which will be difficult to accomplish unless provision is made for the easy removal of the glass. Where such double glazing is contemplated in connection with steel sash it should be remembered that moisture may condense on the interior surface of the metal even if the glass is double. It will usually be found more satisfactory to provide entirely separate frames and glass, placed either inside or outside of the regular window, and stored during the summer. These can be made completely interchangeable with the screens, the same hinges or fasteners being used for both and the putting up of the screens and taking down of the winter sash accomplished at one operation. In order to get as airtight a fit as possible it may be worthwhile to use weather-stripping, perhaps of the cloth-lined variety.

Another way of preventing condensation would be through the direct heating of the glass to a temperature above the dew-point. This method has already been employed to prevent condensation (as well as the accumulation of sleet) on automobile windshields, the heating being accomplished electrically by means of a small element placed in contact with the inside surface of the glass.

* The coefficient of transmission expressed in B.t.u. per hour per square foot per degree Fahrenheit difference in temperature with a wind exposure of 15 miles per hour is, for single glass: 1.13; for double glass .45; for triple glass .281. These values are based on a width of air space between the panes of glass of not less than 1 inch.

Methods for determining humidity. A word should be said concerning the proper means of determining humidity conditions as methods commonly in use are wholly unreliable. The device known as the horse-hair hygrometer is the most convenient in that it gives a direct reading in relative humidity without the use of tables or graphs. It is, however, inaccurate at best, and should never be used unless checked daily with a master instrument. The only reliable instrument, which happens also to be both the cheapest and most accurate, is the wet and dry bulb thermometer. While these instruments are everywhere in common use, it is not usually mentioned in the furnished directions that for results even approximately correct it is necessary to fan the wet bulb until the mercury ceases to fall. The tables are based on an air flow of approximately 600 feet per minute which is not easy to maintain by hand fanning for the minute or so usually required. An electric fan may be used; or a sling psychrometer, a similar instrument made in a form to be swung rapidly in the air, will be found convenient.

METHODS OF HUMIDIFICATION

Elements to be considered. First of all a humidifying device should be adequate to maintain the desired amount of humidity. What this amount may be will depend principally on the feelings of the individuals occupying the house and on such considerations as the prevailing outside winter temperature and the provision made for condensation. The absolute minimum will probably be in the neighborhood of 45% and the maximum around 65% or 70%. Under present conditions the ideal of 80% based on Dr. Huntington's research is difficult to attain without excessive condensation. Although outside and inside air temperatures will have some bearing on the ability of a humidifier to produce given results, the most important consideration is the airtightness of the house. An excessive number of air changes per hour will require the evaporation of very much more moisture and so place a much greater demand on the humidifier.

Another important consideration is the ability of the humidifier to produce an even distribution of moisture throughout the entire house. In bedrooms not commonly occupied except at night humidification is, however, of no great importance. The kitchen and laundry need not be humidified as they are usually too warm and damp to begin with. Theoretically, moisture in the air will spread equally in all directions and produce a uniform humidity throughout any given space regardless of air currents and the location of the source. In practice, however, this will not be found to be the case because the change of air in the house takes place more rapidly than the distribution of the water vapor.

Low cost, both of installation and operation, quietness and ease of control are other important considerations. It goes without saying that no humidifying device should even be considered which depends on manual filling and in addition to being self-operating automatic control is desirable. The advantages of the automatic control of humidity are similar to those of the automatic control of heat, but there may be an even more important reason where a relatively high humidity is to be maintained. With certain types of humidifiers there is considerable danger that without automatic control on a sudden arrival in early spring of a warm calm day the saturation point might be reached and moisture be deposited all over the walls and furniture. Humidity controls depending on the expansion and contraction of some hygroscopic material such as balsa or animal membrane are, however, almost as simple as thermostats and as accurate and reliable.

Centralized system. Those means of humidification used in connection with a warm-air system or a centralized duct arrangement have many advantages. An even distribution throughout the house is, of course, obtained, and where a noise may be produced it can be eliminated by offsetting the ducts and lining them with hair felt for a short distance. Pans placed over warm-air furnaces, even when fed by a float valve, are usually of little value. In order for the pan method to be effective a large water surface must be exposed and the water must be heated to the steaming point, which can usually only be accomplished by means of immersed steam coils. (With any method of this kind there is apt to be a considerable deposit of lime where the water is hard.)

With a warm-air system good results can be accomplished at a minimum of expense by the drip method. This involves nothing more than letting water controlled by a needle-valve drop in one or more places, either directly on top of the hot dome of the furnace or on a piece of sheet metal placed just above the dome. The surplus in spring and fall can run off through a floor drain, or the flow may be regulated by an electric valve automatically turned on and off by a humidity control. One device of this kind is so made that its flow is regulated directly by an element that expands and contracts with the variation in temperature of the air, thus causing it to drip only when the furnace is operating.

A water spray has the advantage that in addition to producing a high humidity it serves to wash the air and even to cool it in summer. The water used for humidifying purposes will probably have to be heated unless, as with some systems, it is sprayed over hot radiators placed in the ducts. Where the domestic supply of hot water is heated by an expensive fuel this result can be accomplished economically by piping the supply to the humidifier through a small indirect coil tapped into the boiler, or where warm air is used, through an exposed coil in the firebox. Where no fan is used the force of

the water spray will help materially in circulating the air through the system.

Separate units. Separate self-contained humidifying units made to be placed in the living portion of the house usually have a low capacity for humidification. Even where their output is great, however, the moisture will not be distributed equally throughout the house but will usually be confined principally to the nearby rooms. For this reason two or more units may be required in even a small house.

The most common system employed in this type of humidifier is probably the water spray, which usually has the disadvantage of being noisy. A somewhat similar but more efficient method depends on dripping water on to a rapidly revolving wheel edged with teeth. This breaks up the water into a fine mist and throws it out by centrifugal force into a small chamber through which air is circulated by a fan operated by the same motor as the wheel. The principle of flowing water over heated radiator surfaces is employed by several manufacturers.

One of the most promising devices produces steam in a specially designed coil placed in the firebox. After being piped to different parts of the house this is liberated directly into the atmosphere. Where steam heat is used this principle can, of course, be employed with the greatest ease by merely placing valves on radiators in different parts of the house, and installing an automatic boiler feed. When first tried out the steam may carry objectionable odors but there is no reason why this cannot be eliminated by a thorough cleaning of the system.

CLEANING AIR

Air entering house. In the city, soot and dust may be so bad as to make it highly desirable to filter all air entering a house, but conditions in the suburbs and country are not likely to be such as to warrant this. Where, however, persons suffer from hay fever, the presence of pollen in the air may create another and perhaps even more vital problem. It is now possible by passing the air entering a house through a special bag, to remove completely all pollen particles from the atmosphere.*

Air within house. Even where the outside atmosphere may be clean, there usually accumulates within a house a considerable amount of air-borne dirt which makes constant dusting a necessity and results in considerable damage to walls and furnishings, especially in the vicinity of radiators and registers. If the house is heated by air recirculated through a centralized duct system, most of this air-borne dirt can be removed, as fast as it forms, by the use of a viscous oil filter. Where expense is not of the first importance this filter should be of the automatic type, as those depending on manual cleaning are apt to be neglected. Where a water spray is used for humidifying or cooling it will, of course, remove most of the dust from the air at the same time.

DE-ODORIZATION

Ozone. Manufacturers of ozone equipment have recommended its use for household de-odorization, especially in kitchens; and various small generators are now on the market. Even if the desired result could not be better produced by ventilation it is probable that the high humidity usually accompanying cooking operations would reduce the output of any such equipment to a point where it would be ineffective.

COOLING

The technique of air-cooling has already been developed in other fields. Its cost is the one obstacle to its immediate and almost universal use in residences. Although a temperature even as low as 86° is apt to cause real danger to the health of small children, in the greater part of America the heat is not so intense as to produce serious discomfort to adults on more than a relatively few days of each year, and so the initial cost of cooling equipment seems unjustified to the average householder. With the introduction of less expensive equipment, however, it is probable that air-coolers will become as common in houses as heating plants and be considered just as essential in those parts of the country where the summers are unusually hot.

Centralized system. There are at present several methods by which houses or parts of them can be cooled without too great expense provided double glazing and proper insulation is used. The method usually employed in theatres, consisting of a spray of either naturally or artificially cooled water, can be used equally well in houses and has the advantage that the uncooled spray may function as a humidifier in the winter time. Instead of the cold water spray it is possible to use in direct contact with the air an artificially refrigerated unit similar to those made to go in iceboxes, but designed with larger fins to handle greater volumes of air. Where a centralized duct arrangement is used for heating purposes these types of coolers for handling an entire house can be very easily installed.

Unit system. For the purpose of cooling a single room there is already on the market a special automatically controlled device** requiring no ducts and consisting merely of a metal cabinet containing a refrigerated unit such as is referred to above operated by a compressor installed elsewhere and a high speed fan to circulate the air over it. This device, costing about $600 installed, is guaranteed to produce a

* Manufactured by Pollenair, Inc., Hickox Building, Cleveland, Ohio.

** Manufactured by the Frigidaire Corporation, Dayton, Ohio.

temperature drop of at least 10 degrees in a room not to exceed 600 square feet in floor area. With electricity at 3c. per kilowatt-hour the operating expenses would be approximately 5c. per hour. It is said that several other large manufacturers are also working on this problem, and that one of them is about to bring out a combination drinking-water and room cooler for offices which will cost but slightly more than the water cooler alone.

De-humidification. Of equal importance with cooling is de-humidification. This is, however, automatically accomplished by the cooling process itself. When the warm air with a high humidity passes through the cold water spray or over the cooling coils it is greatly lowered in temperature to a point far below the dew-point and therefore loses all the excess moisture. Although the air will leave the refrigerating chamber 100% saturated it will contain only a fraction of the moisture that it had on entering and when its temperature is again raised as a result of the infiltration of heats its relative humidity will be low.

Desirable temperature. It may be supposed that as a temperature of approximately 68° is considered ideal, it will, with the ultimate development of house cooling, be desirable to keep the temperature down to that point during the summer months. This seems, however, more than doubtful, not only on account of the extra expense but because so low a temperature in summer is not necessary for complete comfort. In fact with the outside temperature at around 90° an actual feeling of chilliness will be experienced on entering a room with the air at only 68°. The most comfortable summer indoor temperature will probably rise with the rise in the outdoor temperature so as never to produce too extreme a difference.

Possible development. New possibilities in cheap house cooling are indicated by the work of Claude in Cuba. He is now engaged in building a power plant which will generate electricity by means of steam produced in a vacuum at atmospheric temperature and condensed by the very cold water brought up from the bottom of the ocean. After this water has served the purpose of condensing the steam, although still cold, it is of no further use to Claude and he proposes to furnish it at low cost to the residents of Havana to be pumped through radiators in their houses. He suggests that, if the supply from electric plants is not adequate, water might be specially pumped from the bottom of the ocean for this purpose and that it might even be used effectively out of doors in coils placed in the city streets.

EXHAUST FANS

Independent of any other heating or ventilating arrangements it is now customary to equip the kitchen with a small separate exhaust fan. This not only makes for comfort, but also helps to prevent odors from spreading throughout the house. For the same purposes it would usually be worthwhile to provide a fan in the laundry, especially if located in the basement with poor natural ventilation.

DOMESTIC HOT WATER SUPPLY

SEPARATE SYSTEM

The old-fashioned coal heater requiring daily attention has within the last few years been largely replaced by the automatic gas heater. Where, however, gas is not available or is too expensive the advantages of automatic control can be obtained by the use of a small oil burner.

Instantaneous heaters. For small residences, or wherever pipe runs are very short, instantaneous heaters not requiring a storage tank are available both for gas and electricity. Where the hot water consumption is low or its use is apt to be confined to intermittent periods this arrangement is especially desirable as it does away with the constant heat loss from storage tanks. There has also recently come on the market a small compact self-contained electric heater* complete with spout and valve which can be placed on the edge of the wash basin connected directly to the cold water supply line. When the faucet is turned one way cold water is delivered, when turned the other way the water is heated instantaneously, no further equipment of any kind being required. Such an arrangement might be of value in an out-building or week-end house.

COMBINED SYSTEM, AUXILIARY

It has been customary for many years to make use of the main house heating system during the winter to supplement the hot water heater, especially where a more expensive fuel was used for the latter. This was accomplished either by means of a water jacket, an exposed coil in the firebox, or an indirect coil, the latter usually a separate unit but now also available built into the boiler. During the winter months the water was either completely heated in this way or else the chill was taken off and then its temperature raised to the desired point by a separate heater. The only excuse for this system was that it permitted the

* Manufactured by the Electric Heater Corporation, Bridgeport, Connecticut.

substitution of a cheaper for a more expensive fuel, or that it necessitated the care of only one fire instead of two. Contrary to the popular theory there was but slight or no increase in total efficiency. Wherever a boiler is to be used for this double purpose it should be designed of a sufficient size to take care of the extra load.

AUTOMATIC YEAR-ROUND SYSTEM

With steam or vapor heat. With the introduction of oil burners it was found possible by use of an indirect coil in connection with a steam or vapor system to heat the domestic hot water supply automatically the year around. An aquastat with a range from about 150° to 180° is placed in the boiler, thus always maintaining the boiler water at a point hot enough to insure an adequate supply of domestic hot water heated by means of the indirect coil. At the same time the boiler water is never heated hot enough to produce steam unless the house thermostat calls for heat, in which case the burner will run until steam is produced and the house is heated in the usual manner. This system is fully automatic requiring no switches or valves. Regardless of the time of year the water is always hot and the house is never either over or underheated. Any arrangement which depends on the manual operation of valves or switches should be avoided.

With hot-water heat. Recently a similar fully automatic system has been worked out for hot-water heat. Each riser is equipped just above the boiler with a motor valve electrically controlled by means of the house thermostat. These valves open whenever the thermostat calls for heat and close when the desired point has been reached, thus maintaining the house at a constant temperature. Where there are several valves each one, if desired, may be controlled by a separate thermostat placed in that part of the house the heating of which is controlled by the valve. As in the previous arrangement the boiler water is constantly kept by an aquastat at a point sufficient to heat the domestic hot water supply by means of the indirect coil. Some hook-ups call for an extra control to be placed in the hot water storage tank but this is not necessary as the temperature of the water in the tank is controlled indirectly by that of the water in the boiler which in turn can be regulated by adjusting the aquastat. As by this arrangement the water in the boiler is kept at a relatively high temperature a more rapid circulation through the heating system will result when the valves in the risers are opened by the thermostat calling for heat. A certain amount of the drag usual with hot-water heat is thus eliminated. Where the indirect coil is used in connection with a hot-water system it should be placed on a level with the upper part of the boiler considerably higher than is usual with a steam system. In localities where the water is unusually hard it may be well to use a water softener to prevent the loss in efficiency which will result from the indirect coils being deposited with lime. A heater which combines in one unit the indirect coil, a large valve, and all of the necessary controls has recently been put on the market.*

Advantages. As a result of the development of these systems wherever oil burners are used there is no necessity for purchasing separate hot water heaters. In addition to the convenience, the cost of unnecessary equipment is saved and by keeping the burners in constant operation the year around there is no period of extended rest during which they can rust or get out of order. This system has, however, been objected to on the ground that it heats up the basement unnecessarily during the summer. If the boiler, indirect coil and tank are properly insulated this heating effect will be slight and will not be objectionable as it will only be sufficient to prevent the basement from getting damp—and this will be found true even where the boiler is unusually large. While operating most efficiently with oil the systems can also be employed equally well with gas or even coal where mechanically stoked.

* Manufactured by Bell & Gassett Company, 3000 Wallace Street, Chicago.

CHECK LIST OF HOUSE REQUIREMENTS

Sleeping porches:
- Cross draft, open on at least two sides
- Relation to bedroom, direct connection
- Open or enclosed
- Heated or unheated

Dining porches:
- Direct access from kitchen or pantry
- Open or enclosed

Sitting porches:
- Cross draft
- Privacy
- Use of roof

Roof porches and terraces:
- Use
  - Sitting
  - Eating (service requirements)
  - Sleeping
  - Sunbathing (privacy, protection from wind), special room (heat)
  - Play
- Layout—
  - Open terrace
  - Covered porch (screened)
- Auxiliary equipment—
  - Lavatory
  - Telephone
  - Dumbwaiter
  - Outdoor fireplace
- Stairs—
  - Exterior (accessible ground)
  - Interior (pent house or hatch)

Waterproofing—
- Canvas
- Built-up membrane
- Monolithic concrete (integral or surface waterproofing)
- Welded metal

Scuppers, interior downspouts

Surfacing—
- Canvas (painted)
- Cement (over concrete)
- Wooden slats
- Earth with grass (flowers) and flagging (stone, slate, soapstone, brick, tile, concrete slabs)

Sand with flagging
- Gravel
- Tile (slate) set in mastic (cement joints)
- Rubber paving tile
- Zenitherm
- Wood blocks (end grain)

Insulation—
- Main roof, upper roof
- Summer, winter
- Type
- Quantity (omit under gutters and around conductor heads)

Parapets and railings—
- Open for cross draft and visual outlook
- Non-climable
- Height: 35″ to 37″

Soil stacks—
- Can be carried up through pent house or in chimney

Windows:

General considerations—
- Fewer large units preferable to numerous small units
- Ease of operation
- Corner windows
- Unbroken glass areas
- Complete opening

Types—
- Double-hung
- Casement (opening in or out)
- Sliding
- Lowering into pockets
- Sliding-folding
- Windows opening to floor

Special window installations—
- Windows for growing plants (heat, ventilation, drain)
- Bedroom windows, to prevent rain from coming in
- Ultra-violet glass

Double-glazing—
- To prevent condensation and reduce heat loss
- Storm sash interchangeable with screens
- Airtightness

Fixed windows

Shutters—
- Rolling steel shutters

Insect screens—
- Outside
- Inside (fixed, hinged, sliding, roll-up)

Curtains and shades—
- Curtains (heavy, transparent)
- Pulls
- Concealed built-in curtain rods
- Space for curtains at side
- Venetian blinds

Heating:

Centralized duct system (warm-air furnace or radiators)—
- Gravity system
- Combination system (booster fan and by-pass)
- Forced-air system
- Outside vs. recirculated air (adequate cold air returns)

Radiator system—
- Direct or semi-indirect
- Steam or vapor
- Hot water (auxiliary pump)
- Panel Heating system

Fuels—
- Coal (manual firing or automatic stoking)
- Oil (sound-deadening, low water cut-off)
- Gas (central or unit system)
- Electricity (off-peak storage system or unit system)

Automatic controls—
- Location (portable thermostat)
- Clock thermostat
- Special uses (garage, bedrooms, etc.)

Failure of heating system—
- Oil (reliability of repair service, large storage tank, oil gauge in conspicuous location, double-duty boiler)
- Gas (storage battery to operate controls)

Fireplaces—
- Built-in firescreen
- Franklin stove
- Wood storage

Humidification:

General considerations—
- Adequate capacity
- Even distribution
- Quietness
- Self-operating
- Automatic control

Centralized system—
- Pans (water must be heated)
- Drip
- Water spray (water heated or sprayed over radiator)

Individual units—
- Water spray
- Humidifying radiators
- Steam

Cleaning air:
- Air entering house (hay-fever pollen)
- Air within house
- Methods—
  - Viscous oil filter (manual or automatic)
  - Water spray

De-odorization:
- Ozone

Cooling:
- Centralized system—
  - Waterspray
  - Refrigerated coils
- Unit system
- De-humidification

Exhaust fans:
- Kitchen
- Laundry

Domestic hot water supply:
- Separate system—
  - Instantaneous heater (gas or electric, central or unit)
- Combined system—
  - Auxiliary
  - Automatic year around (steam, vapor or hot water)

Wallace

HOUSE OF M. ALBERT LINTON
MOORESTOWN, N. J.
EDWARDS AND HOFFMAN, ARCHITECTS

Site: deep lot with narrow end toward the road and facing south.

Roof: variegated gray and green slate.

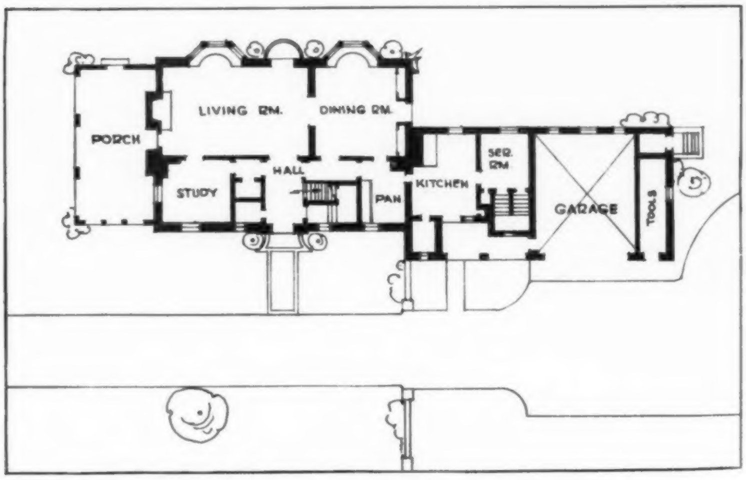
Chimneys: common hard-burned brick with stone caps.

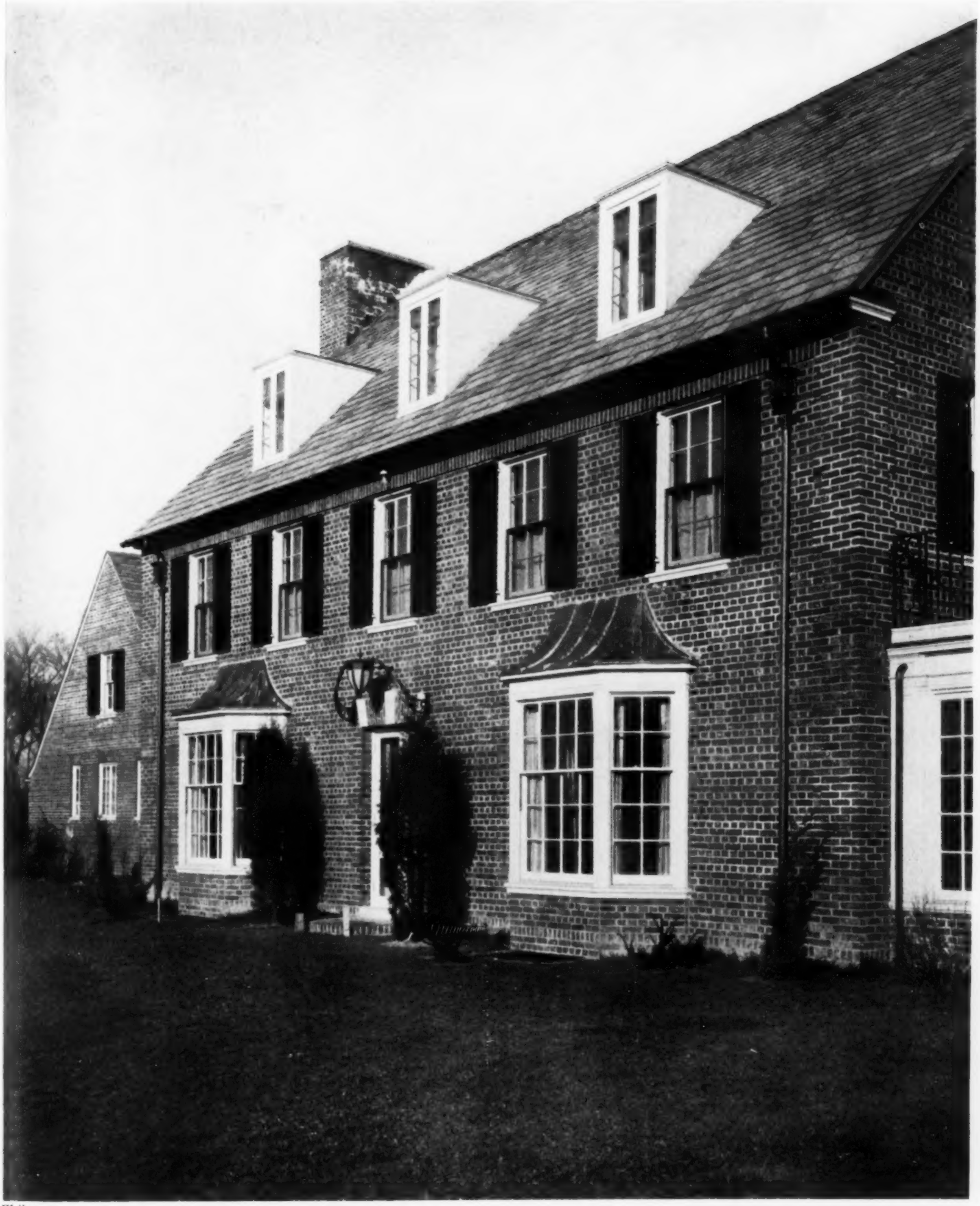
Windows: double hung wood sash.

Walls: common hard-burned brick with struck joints.

Color scheme: brick work, dark red; windows, deep cream; shutters, very dark green; iron work, black.

Cost per cu. ft.: 80c.

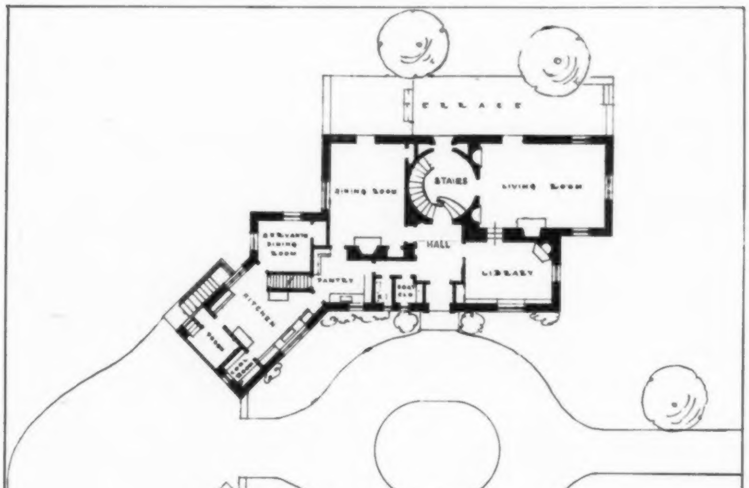




Wallace

HOUSE OF M. ALBERT LINTON
MOORESTOWN, N. J.
EDWARDS AND HOFFMAN, ARCHITECTS

HOUSE OF MRS. JOHN D. NEWBOLD, JR.
CHESTNUT HILL, PA.
EDWARDS AND HOFFMAN, ARCHITECTS



Site: house faces north and south on crest of a hill.

Roof: shingle.

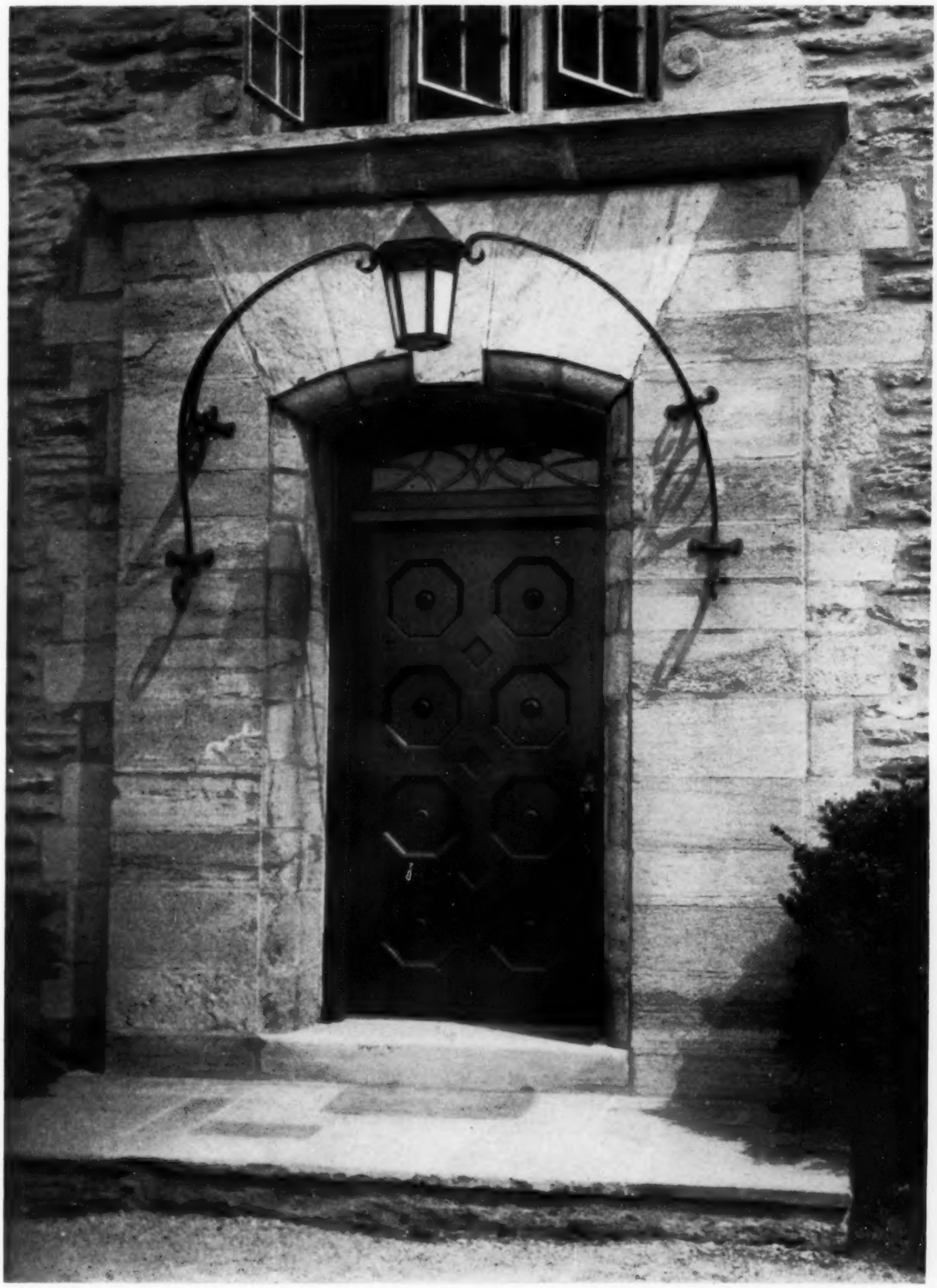
Chimneys: local stone with diaper pattern of brick work.

Windows: steel casement.

Walls: local stone with dressed local stone at front entrance.

Color scheme: stone work slightly rusty in color showing light tones of yellow and brown; windows and frames, painted dark green; front door and frame, oak.

Cost per cu. ft.: approximately 55c.

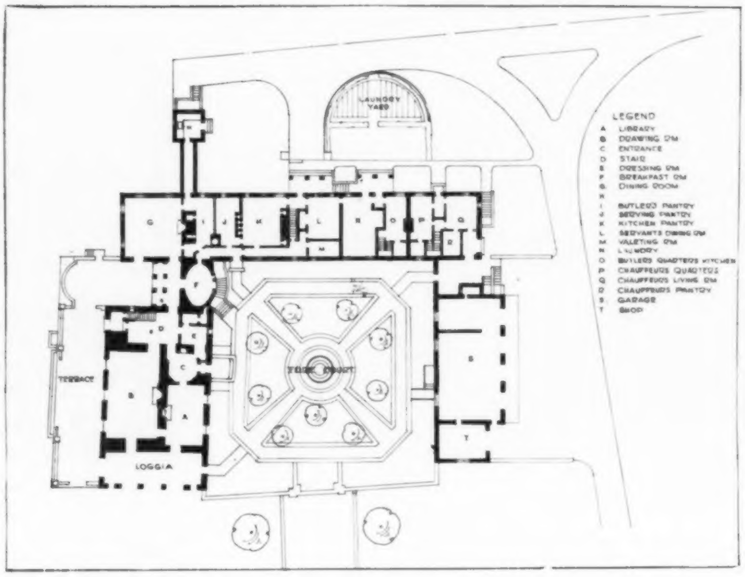


HOUSE OF MRS. JOHN D. NEWBOLD, JR.
CHESTNUT HILL, PA.
EDWARDS AND HOFFMAN, ARCHITECTS

Weber

Weber

HOUSE OF RUSSELL TYSON
NORTH ANDOVER, MASS.
PERRY, SHAW AND HEPBURN, ARCHITECTS
FLETCHER STEELE, LANDSCAPE ARCHITECT



Site: on a slight rise, surrounded by large trees.

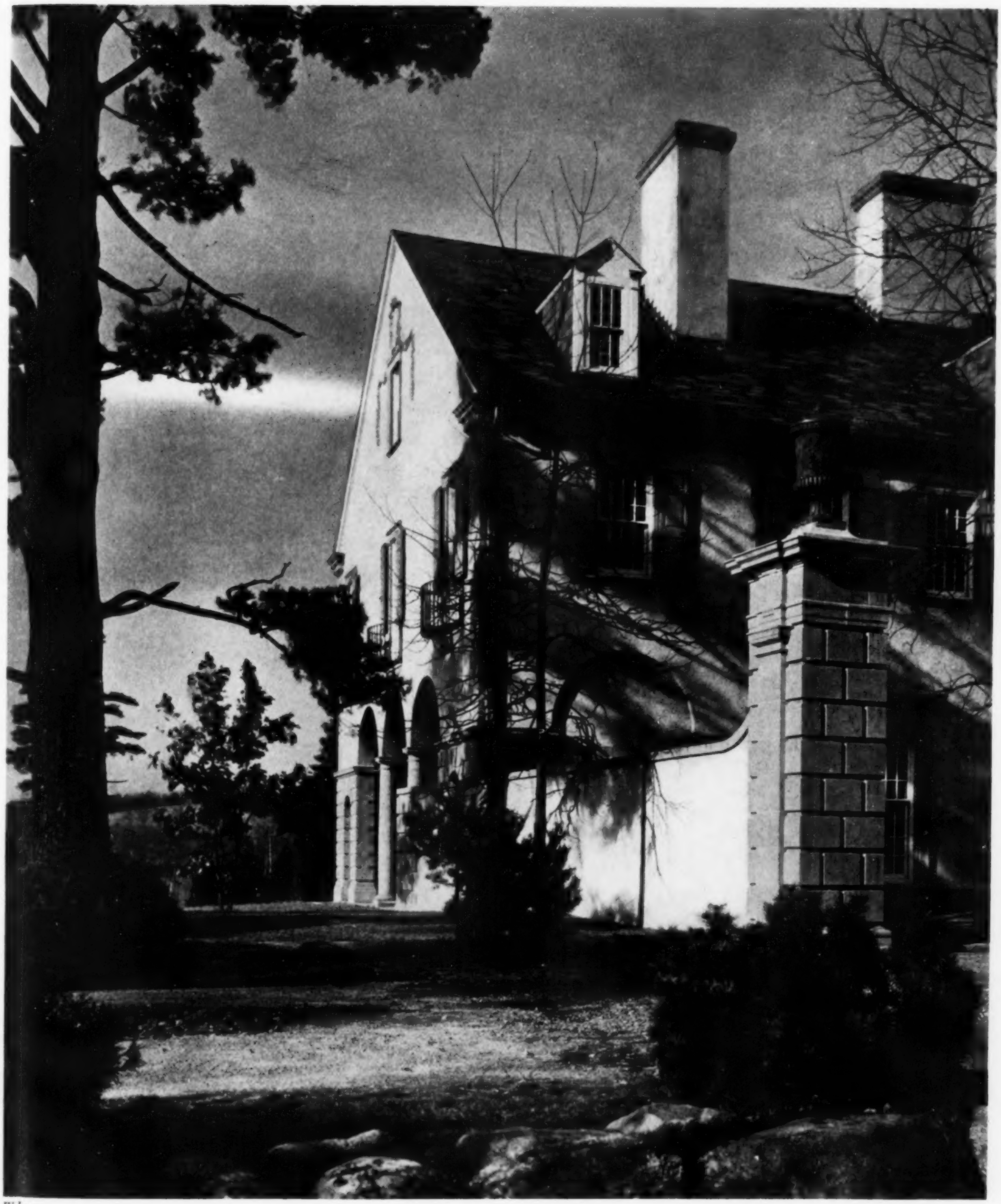
Roof: slate.

Chimneys: stuccoed, stone caps.

Windows: wood.

Walls: brick, stuccoed.

Color scheme: pink-gray walls, white woodwork, blue-green shutters.



Weber

HOUSE OF RUSSELL TYSON
NORTH ANDOVER, MASS.
PERRY, SHAW AND HEPBURN, ARCHITECTS

Taylor and Son

HOUSE OF HAROLD SEAMAN
RIVER HILLS, WISCONSIN
FITZHUGH SCOTT, ARCHITECT

Site: open field rising gradually from banks of Milwaukee River, with a few fine trees and orchard to north. To raise house and overcome possible flood conditions, entance was terraced on north side following line of drive; a service court walled in on east and the ground graded to river on west and south.

Construction: Cincrete and tile joists for floor; stone and Cincrete blocks for all walls. Lime stone from Madison, Wisconsin; a warm yellow, in blocks of varying size.

Windows: steel casements opening out, screened with roll screens and glazed with leaded plate glass and occasional antique panes.

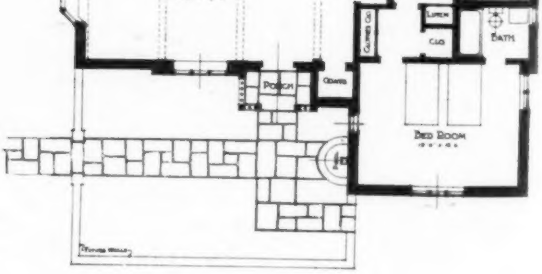
Roof: handmade Yale Memorial slate tile of large size, rough texture, a soft dark bluish gray. Tile ridge, lead flashing. Gutters, leaders and leader heads of cast lead.

Taylor and Son

HOUSE OF HAROLD SEAMAN
RIVER HILLS, WISCONSIN
FITZHUGH SCOTT, ARCHITECT

Rittase

HOUSE OF MRS. EMMA ASPLUNDH
BRYN ATHYN, PA.
HAROLD THORP CARSWELL, ARCHITECT



Rittase

HOUSE OF MRS. EMMA ASPLUNDH
BRYN ATHYN, PA.
HAROLD THORP CARSWELL, ARCHITECT

Site: a lot 75′ x 150′ with the narrow side fronting south; about 5′ below sidewalk level; prevailing breeze from the southwest.

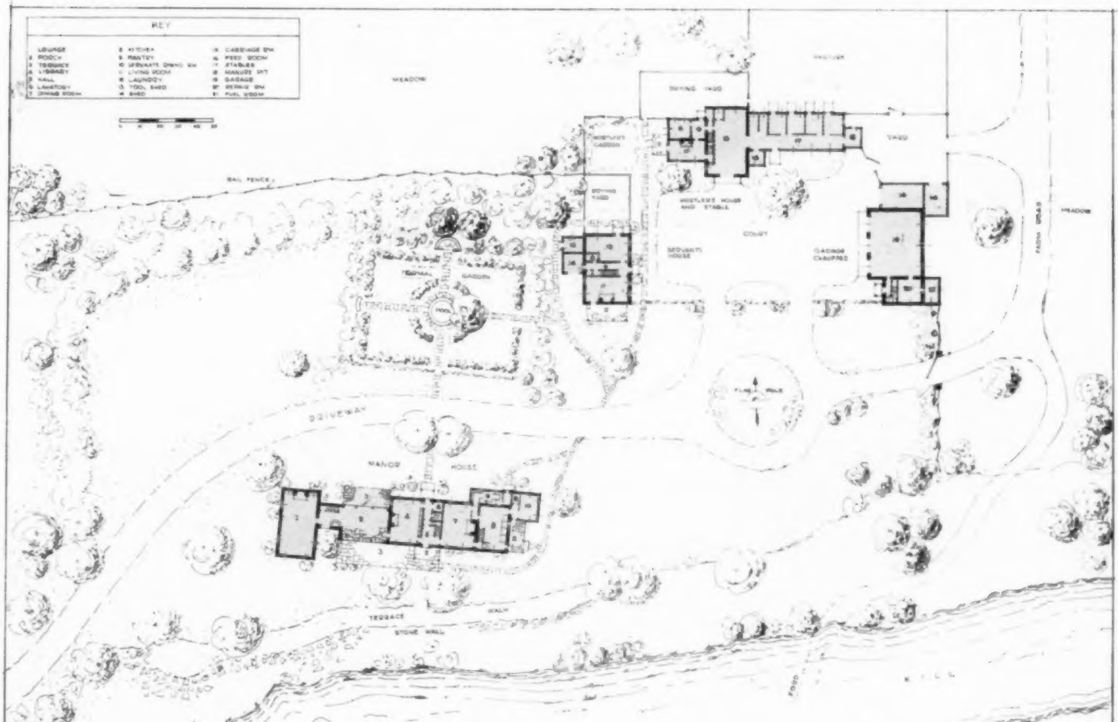
Roof: cedar shingles left to weather, slightly rounded valleys.

Windows: casement sash.

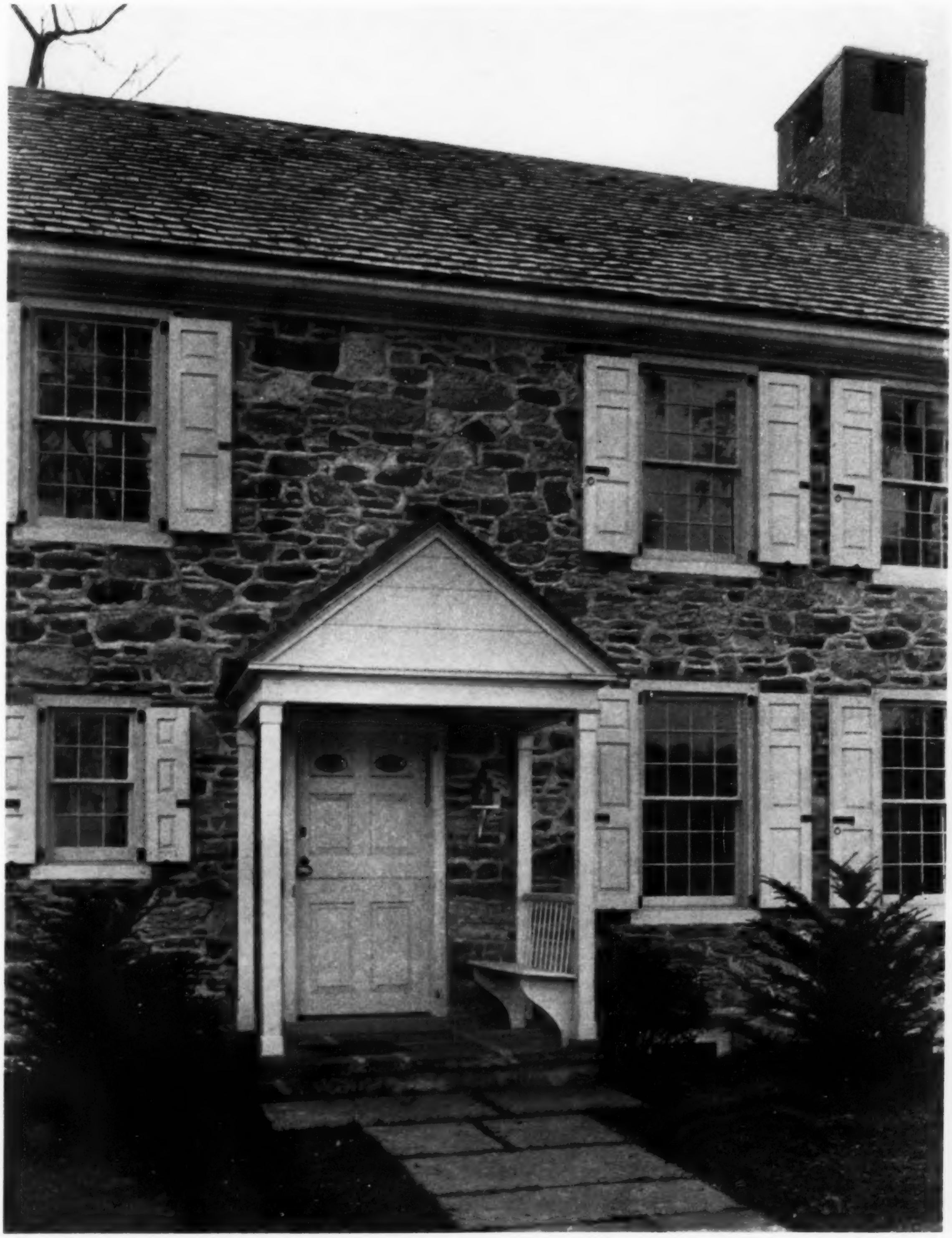
Walls: hollow stone concrete blocks with common brick for label courses over the windows and for chimney offsets.

Color scheme: all masonry painted cream-white and brickwork wiped before taking set; woodwork stained creosote, whitewashed, and wiped after twenty-four hours, producing a soft gray with whitewash filling the pores of the wood; casements painted dark green.

Cost per cu. ft.: 52c.



ESTATE OF WILLIAM E. BRUYN
ULSTER COUNTY, NEW YORK
TELLER AND HALVERSON, ARCHITECTS



HOUSE OF WILLIAM E. BRUYN
ULSTER COUNTY, NEW YORK
TELLER AND HALVERSON, ARCHITECTS

ESTATE OF WILLIAM E. BRUYN
ULSTER COUNTY, NEW YORK
TELLER AND HALVERSON, ARCHITECTS

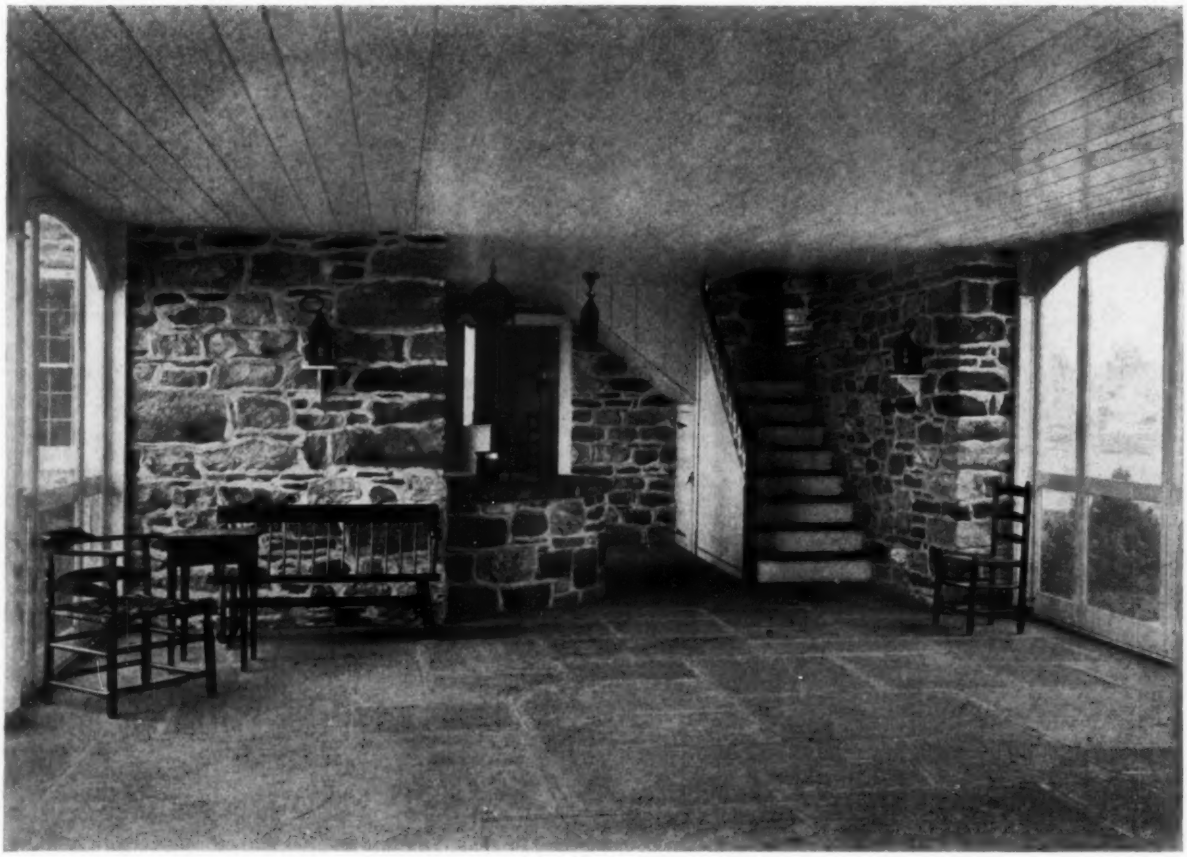
Servants' Cottage.

Site: on the banks of the Shawangunk Creek.

Problem: the house was a low rambling Dutch Colonial stone house, dating back in the Bruyn family records to 1694, and to make a summer home, the owner desired to restore the old house, enlarging a part by raising it to two stories and adding a wing for the accommodation of guests. This required leveling to the ground all but that part of the old house still occupied, as the kitchen.

Walls: stone to match that of old house left standing, reusing old stone from walls torn down and adding new from the same local source that supplied the original builders.

Floors: wide oak boards of varying widths secured with hand-headed spikes. In most cases the floor beams of the second story form the ceilings of the rooms below.



HOUSE OF WILLIAM E. BRUYN
ULSTER COUNTY, NEW YORK
TELLER AND HALVERSON, ARCHITECTS

Porch, view toward lounge. Stair leads to guest rooms over lounge room.

Roofs: 24" hand-rived cypress shingles, left to weather.

Chimneys: Ulster County brick, capped with native blue stone flag.

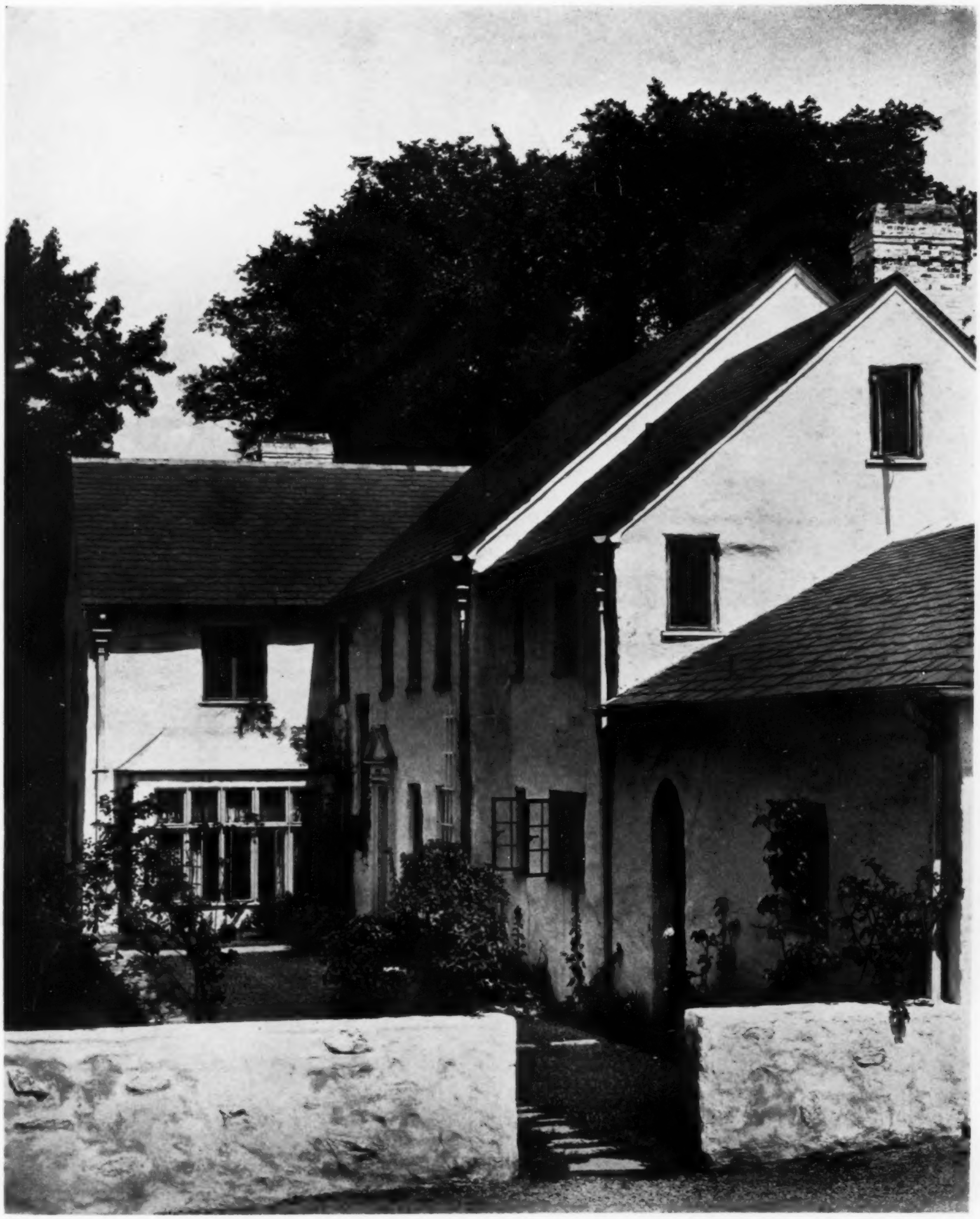
Outside trim: wide white pine clapboarding, log gutters.

Windows: double-hung sash with small lights, old glass 6" x 8" and 7" x 9"; paneled shutters hung and fitted with hand-forged iron hardware.

Terraces and porches: native blue stone flag flooring, rectangular in form, laid with broken joints.

Color scheme: walls, gray and pink grit stone with a mingling of blue black and rusty face stone; outside woodwork finished ivory white.

HOUSE OF J. ALLYN OAKLEY
MONTCLAIR, N. J.
DOUGLASS FITCH, ARCHITECT


Costain

HOUSE OF ALAN U. MANN
SCARSDALE, NEW YORK
ELECTUS D. LITCHFIELD, ARCHITECT

Castain

HOUSE OF ALAN U. MANN
SCARSDALE, NEW YORK
ELECTUS D. LITCHFIELD, ARCHITECT

Site: sloping, bordered by giant oaks.

Construction: "stockade blocks," a patented material, composed of excelsior treated with magnesite and other fireproofing materials, compressed into blocks, which are set with reinforced cores of concrete, and stuccoed, whitewashed or painted.

Roof: graduated black slate.

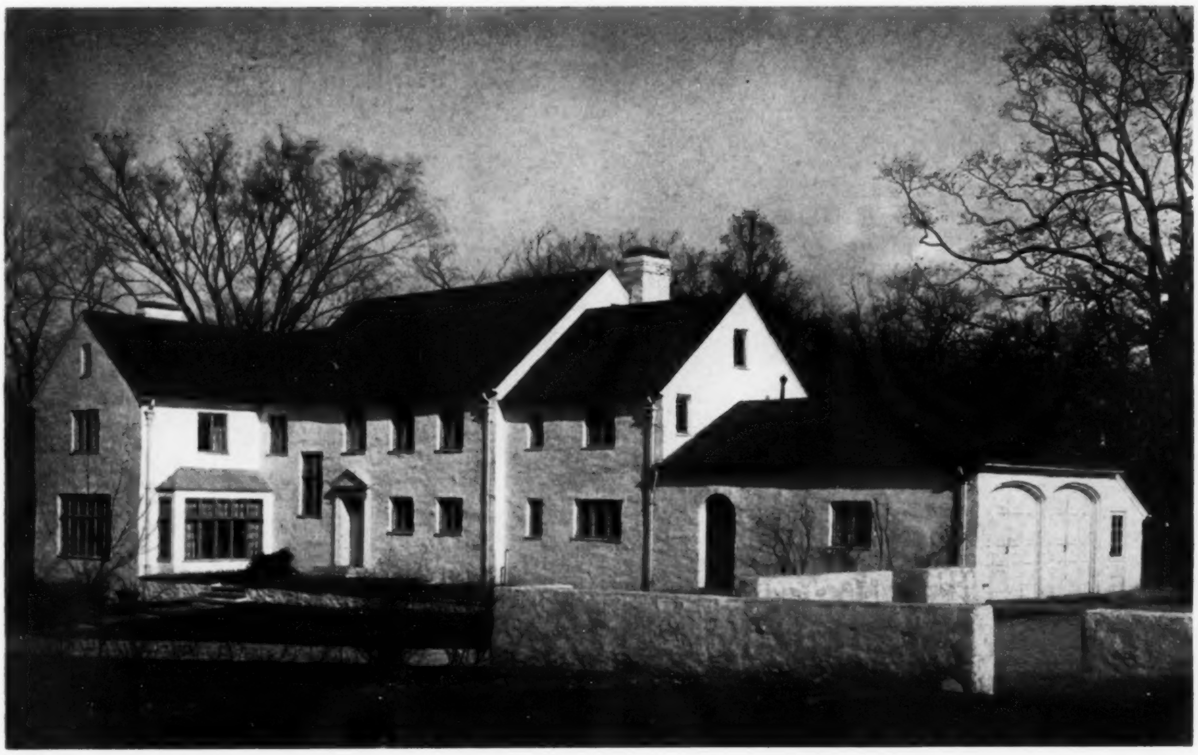
Chimneys: whitewashed brick.

Windows: Crittall steel casement, with rectangular leading, and colored inserts in the stairway windows.

Color: entrance woodwork painted white; window frames a yellow buff.

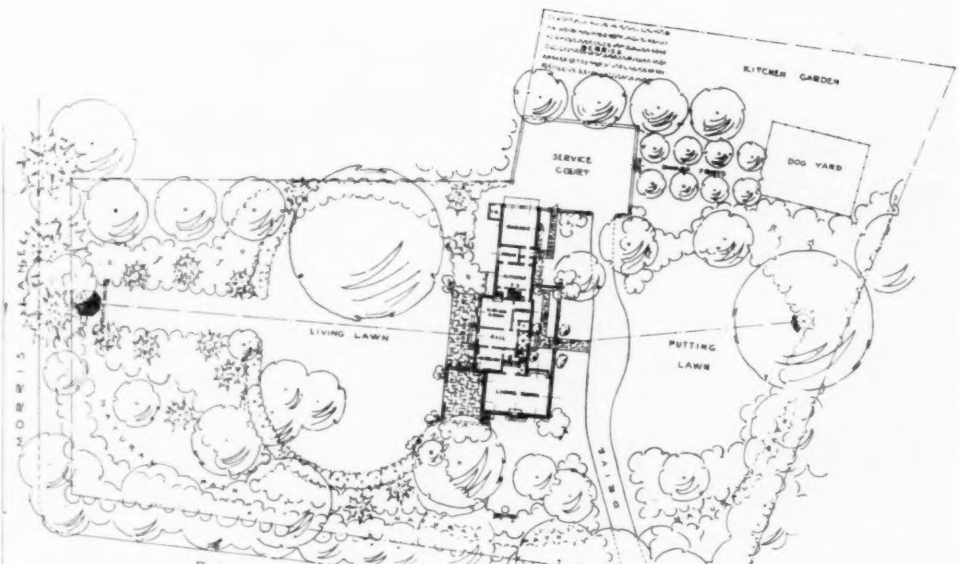
Interior: pine woodwork in natural color; sand-finished walls slightly stained.

Cost per cu. ft.: 60c.



Costain

HOUSE OF ALAN U. MANN
SCARSDALE, NEW YORK
ELECTUS D. LITCHFIELD, ARCHITECT
L. HARVEY RUDE, LANDSCAPE ARCHITECT



Wallace

ESTATE OF PERCY MILTON CHANDLER
BRANDYWINE LODGE, CHADDSFORD, PA.
RITTER AND SHAY, ARCHITECTS
EXLEY AND KITE, LANDSCAPE DESIGNERS

Site: a remodelled farmhouse on the site of the battle of Brandywine. Advantage of the contour of the ground was taken in placing the swimming pool and bath houses on a lower level approached by means of steps and terraces.

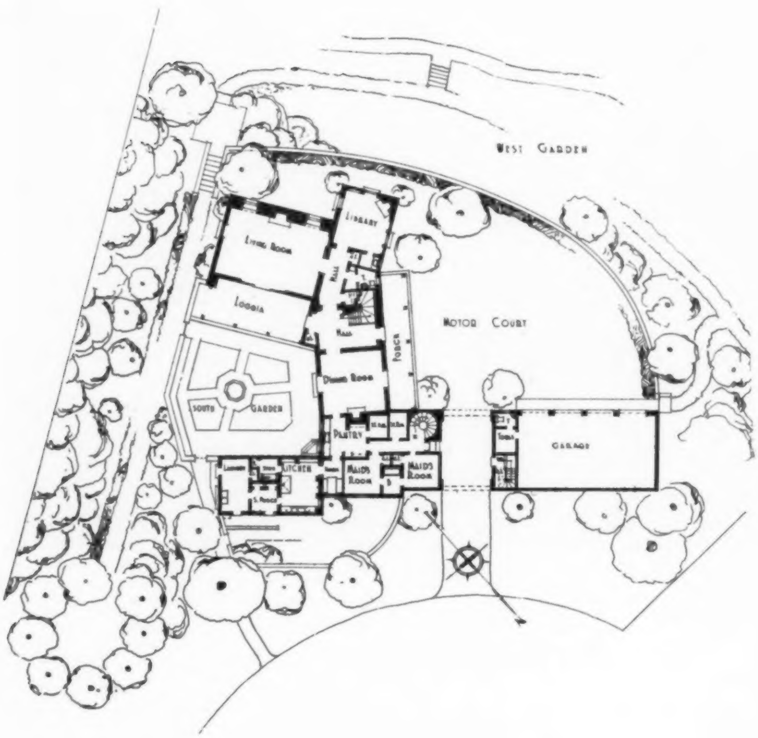
Construction: white stucco with dark green shutters and a copper roof; cast iron on upper porches painted white.

Wallace

ESTATE OF PERCY MILTON CHANDLER
BRANDYWINE LODGE, CHADDSFORD, PA.
RITTER AND SHAY, ARCHITECTS

Haight

HOUSE OF D. C. NORCROSS
LOS ANGELES
ROLAND E. COATE, ARCHITECT
A. E. HANSON, LANDSCAPE ARCHITECT

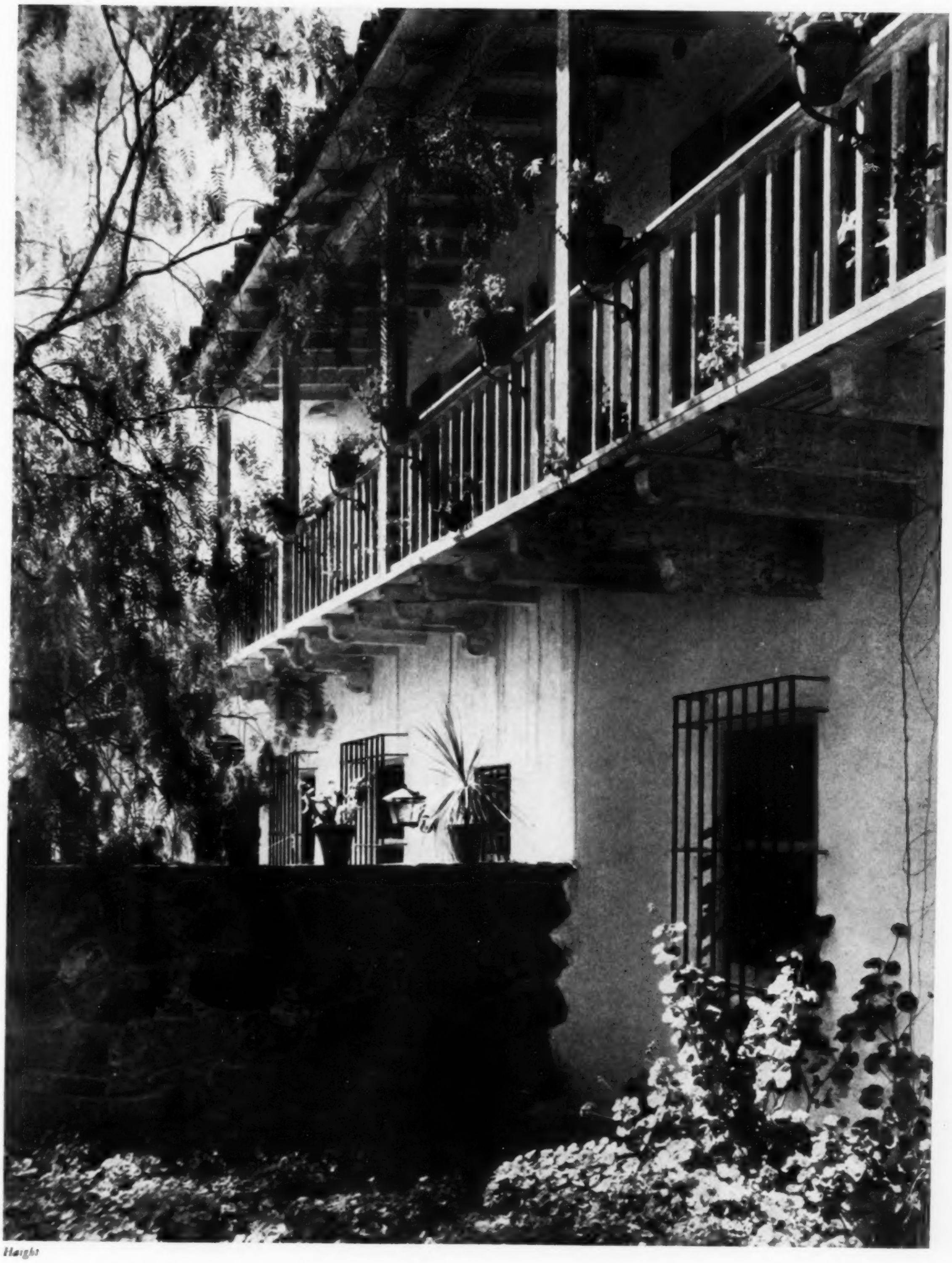


Site: instead of stepping down the various rooms with the grade, ground was excavated so that the house itself rests practically level.

Roof: rough laid hand-made tile, almost yellow in color.

Walls: covered with Gunite which in turn has been given a hand trowelled coat of stucco, resembling old-fashioned lime plaster in texture and color.

Color scheme: walls are pure white. Some windows are painted antique yellow, others green. Shutters are green; likewise the iron work.



Haight

HOUSE OF D. C. NORCROSS
LOS ANGELES
ROLAND E. COATE, ARCHITECT

Haight

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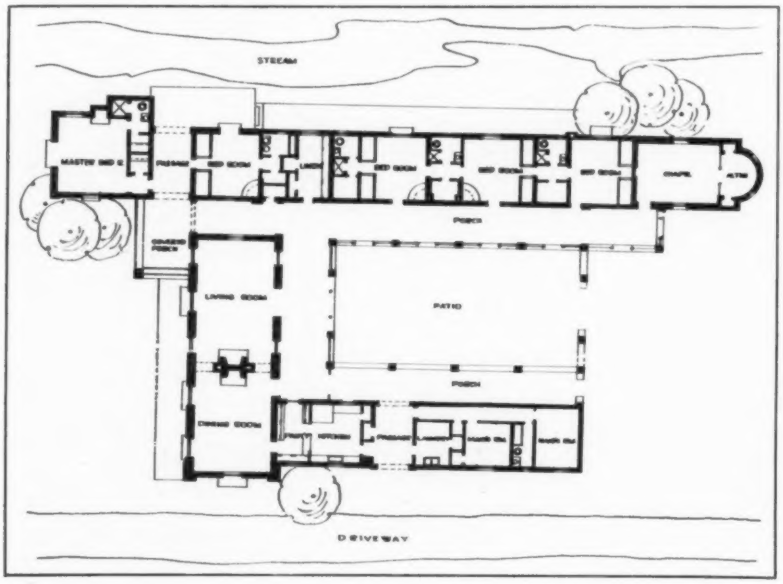
Padilla Studios

RANCH HOUSE FOR E. L. DOHENY
SANTA PAULA CANYON, CALIF.
WALLACE NEFF, ARCHITECT



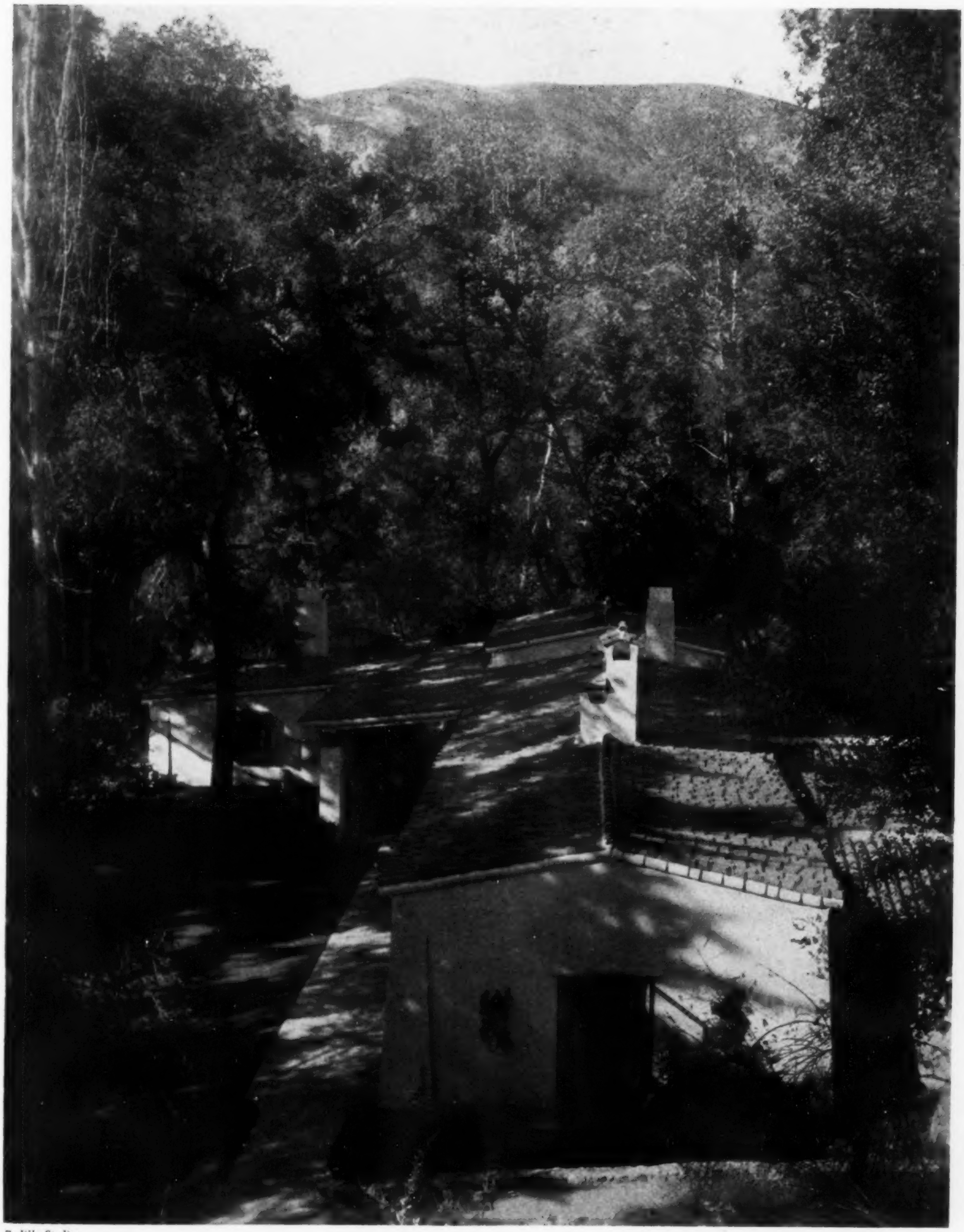
Site: along trout stream banked on each side with tremendous oak trees.

Roof: handmade burned clay tiles. Eaves are kept short to admit plenty of sunshine.

Chimneys: whitewashed brick with handmade tile caps.

Windows: California sugar pine.

Color scheme: walls of whitewashed brick; windows, shutters and iron work painted turquoise blue; tile floors and roof of a variegated rose shade.



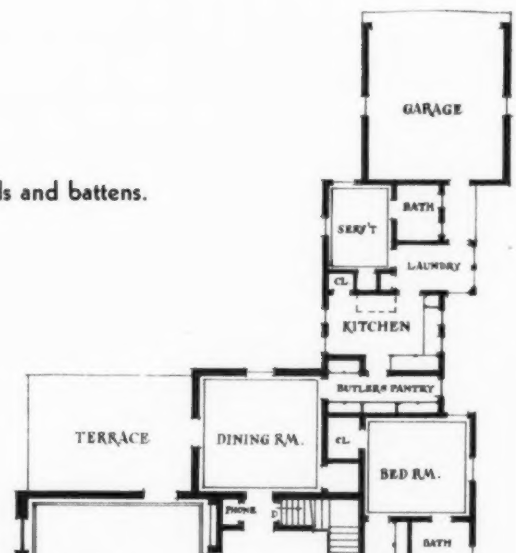
Padilla Studios

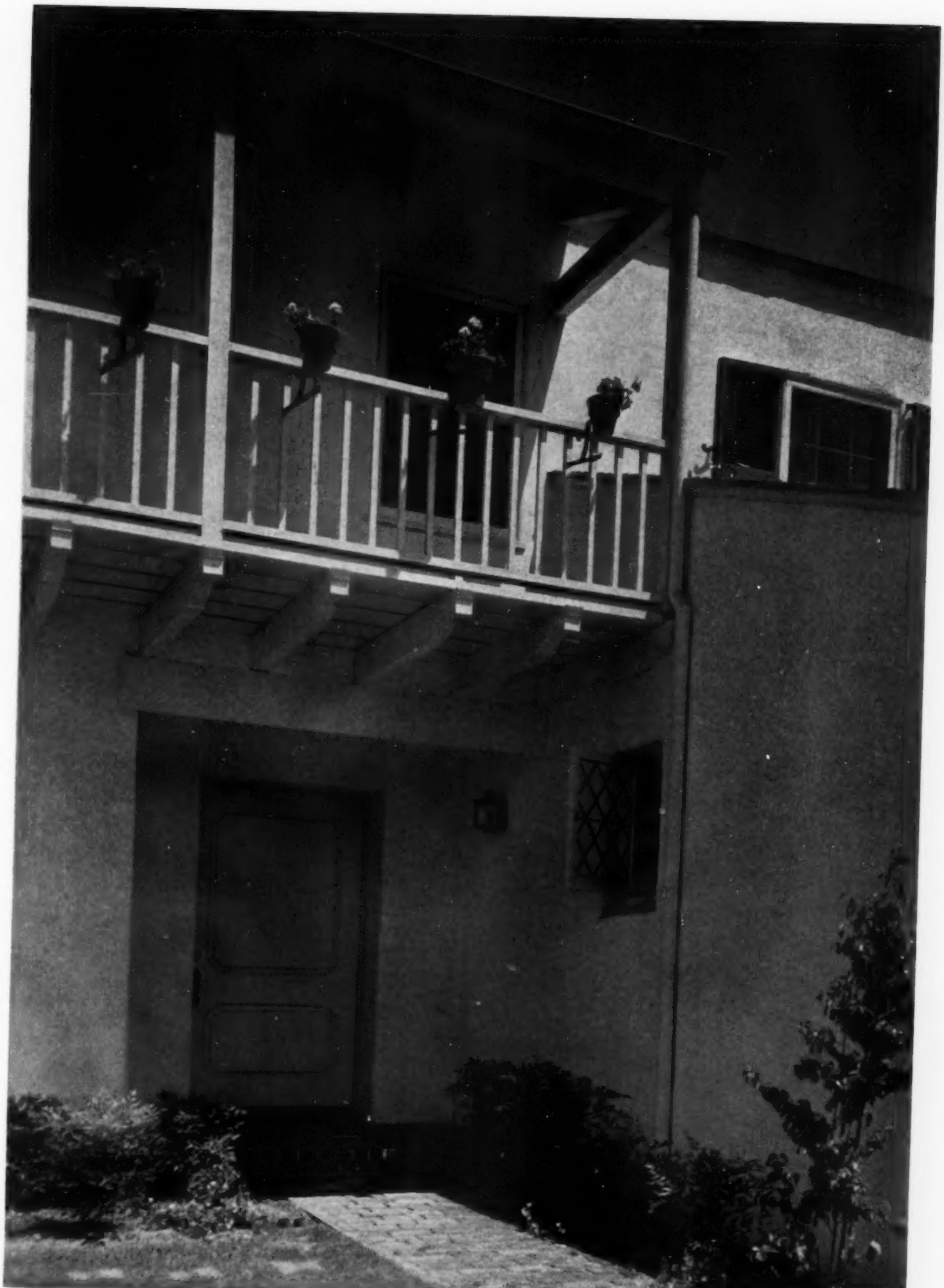
RANCH HOUSE FOR E. L. DOHENY
SANTA PAULA CANYON, CALIF.
WALLACE NEFF, ARCHITECT

Haight

HOUSE OF MRS. WILLIAM REDING
PASADENA, CALIF.
GARRETT VAN PELT, JR., ARCHITECT

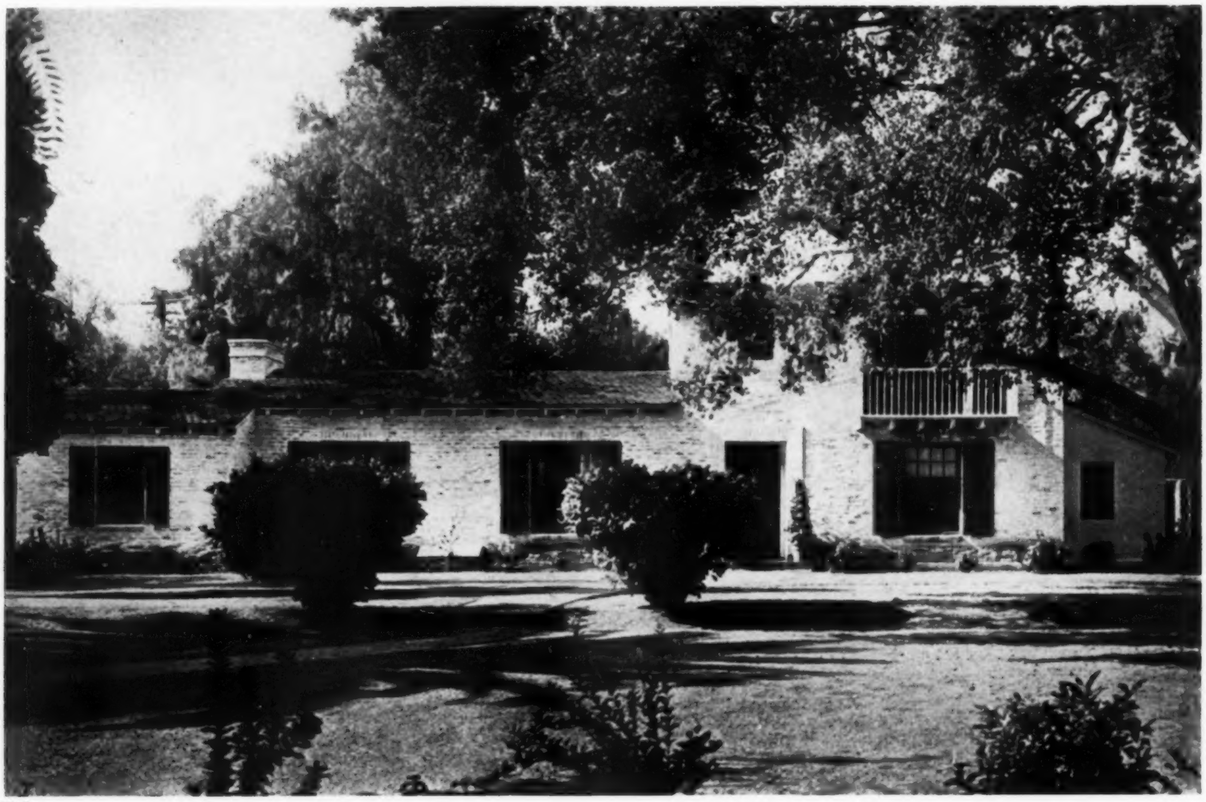
Construction: stucco with vertical boards and battens.
Roof: split shake.
Cost per sq. ft.: $4.





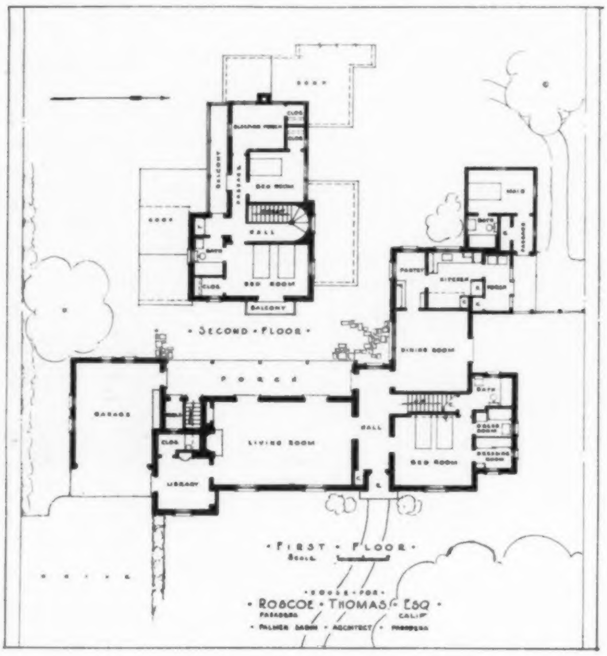
Haight

HOUSE OF MRS. WILLIAM REDING
PASADENA, CALIF.
GARRETT VAN PELT, JR., ARCHITECT



Clarke

HOUSE OF ROSCOE THOMAS
PASADENA, CALIF.
PALMER SABIN, ARCHITECT



Site: house planned to fit existing basement and original planting. Advantage taken of a large pepper tree and a large oak tree on the property.

Roof: cedar shingles laid slightly random.

Chimneys: common brick seconds from old foundation.

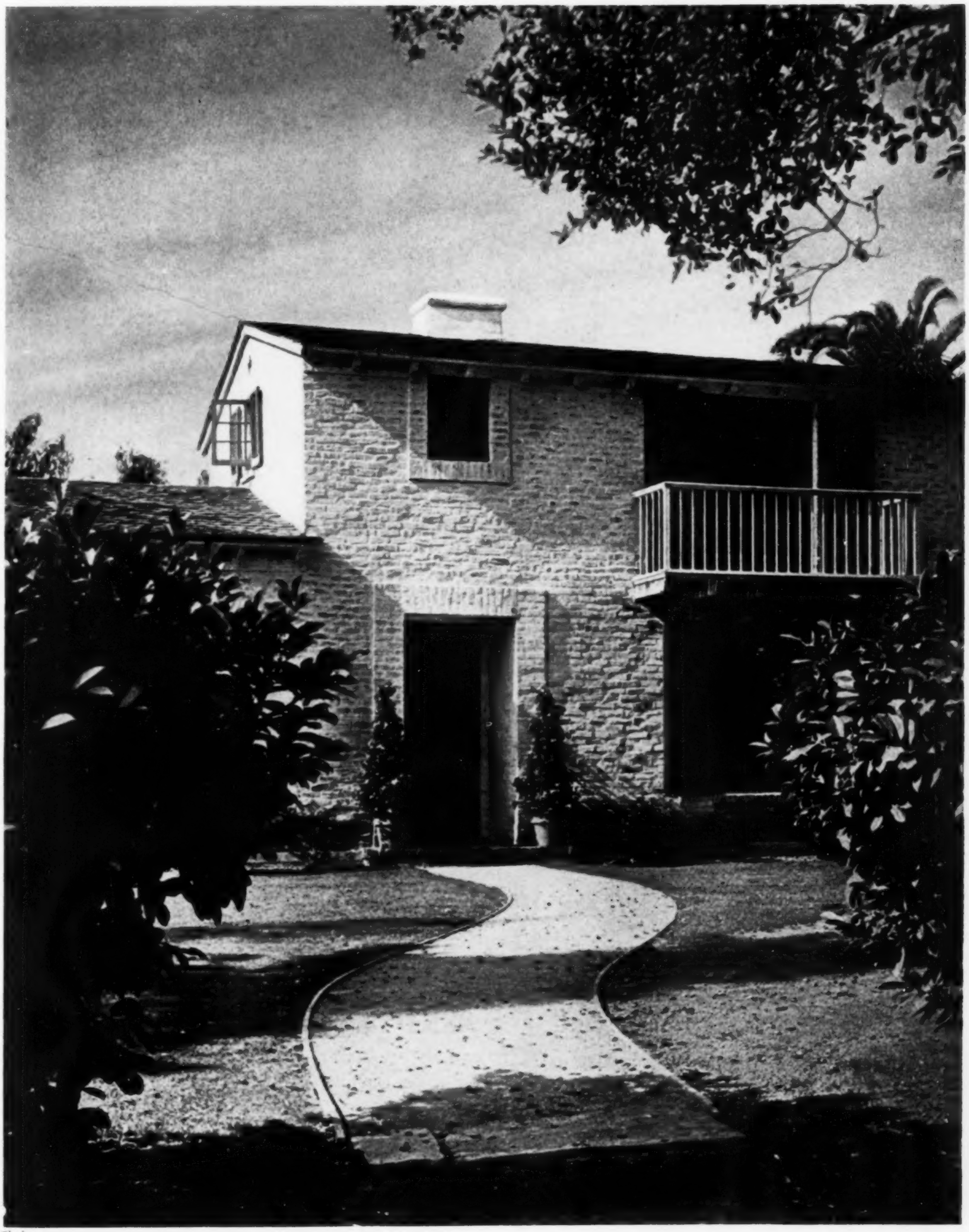
Windows: double-hung, wood.

Walls: common brick seconds slightly random with flush joints.

Color scheme: exterior of walls of whitewashed brick using a thin coat of whitewash to blend the cement-stained brick; all sash sage green; balconies whitewashed and painted white.

Design: full use made of materials from old house. Living room given major importance with garden on the west.

Cost per cubic foot: 45c.



Clarke

HOUSE OF ROSCOE THOMAS
PASADENA, CALIF.
PALMER SABIN, ARCHITECT

Clarke

HOUSE OF ROSCOE THOMAS
PASADENA, CALIF.
PALMER SABIN, ARCHITECT

Nyholm and Lincoln

HOUSE OF MRS. FREMONT C. PECK
LOCUST VALLEY, LONG ISLAND
BENJAMIN W. MORRIS, AND
LANSING C. HOLDEN, JR., ARCHITECTS
ARMISTEAD FITZHUGH, LANDSCAPE ARCHITECT

Roof: shingle tile, dark gray-green at the eaves to orange at the ridge.

Chimneys: common brick with burnt headers freely used and terra cotta chimney pots.

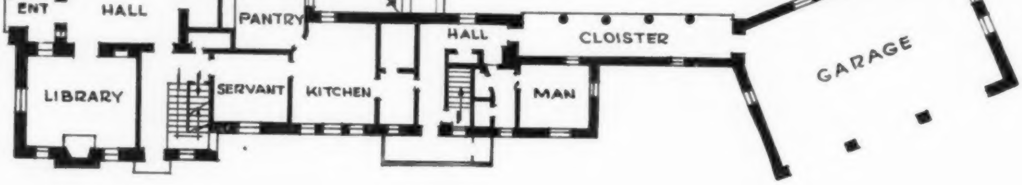
Windows: steel casement.

Walls: common brick built without plumb line, painted with a cream color waterproof cement wash. Tower windows and main entrance doorway trimmed with imported French limestone.

Cost per cu. ft.: $1.07.

Toloff

HOUSE OF FRED P. WARREN
EVANSTON, ILLINOIS
REGINALD D. JOHNSON, ARCHITECT
RUTH DEAN, LANDSCAPE ARCHITECT



Site: level city lot.

Roof: heavy shingles.

Chimneys: common brick painted white.

Windows: wood casement.

Walls: common brick painted white.

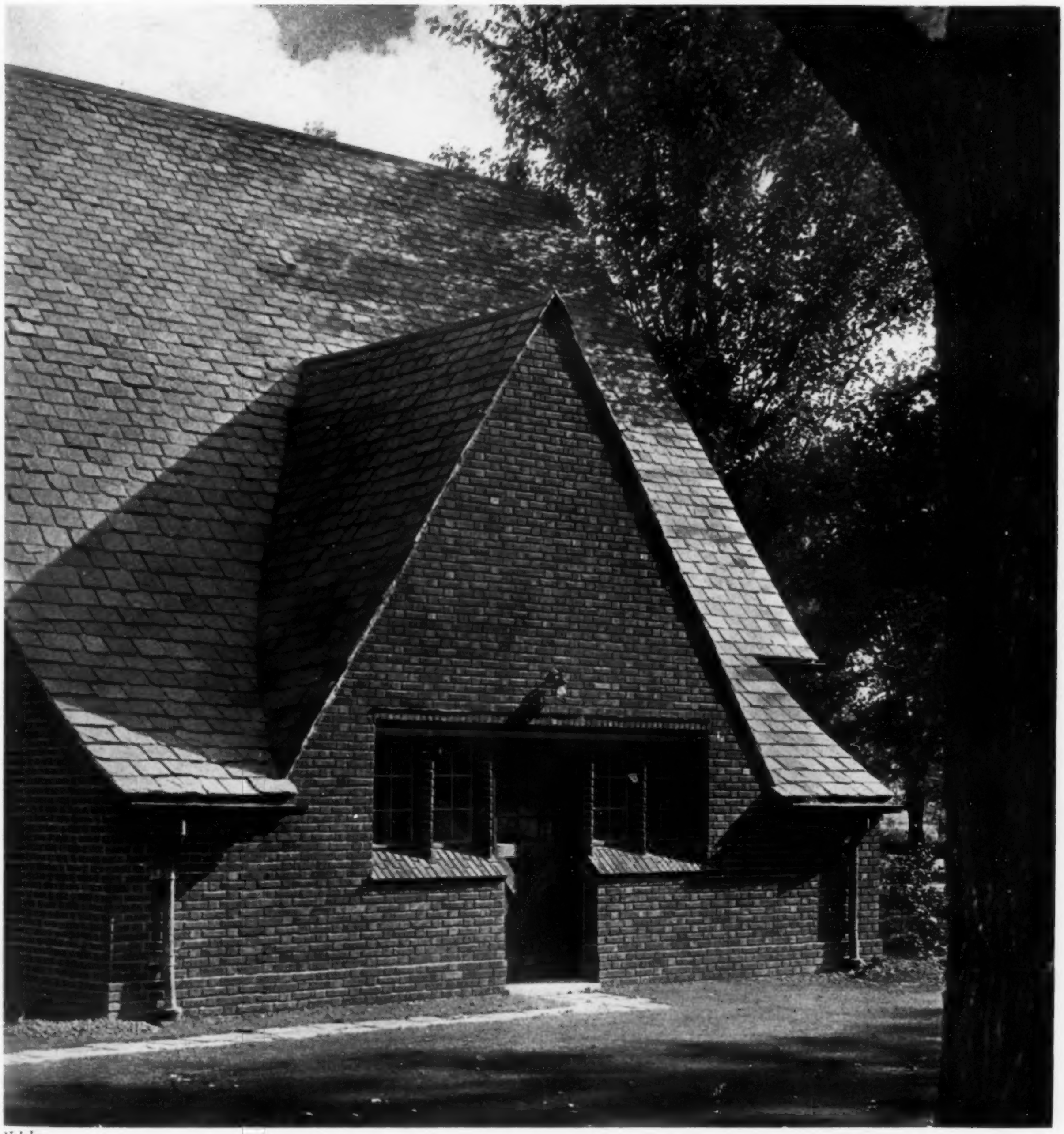
Color scheme: walls white; shutters green; roof natural.

Toloff

HOUSE OF FRED P. WARREN
EVANSTON, ILLINOIS
REGINALD D. JOHNSON, ARCHITECT

Teloff

HOUSE OF FRED P. WARREN
EVANSTON, ILLINOIS
REGINALD D. JOHNSON, ARCHITECT



Nyholm

HOUSE FOR JAMES TURNER
GROSSE POINTE, MICH.
HENRY F. STANTON, ARCHITECT

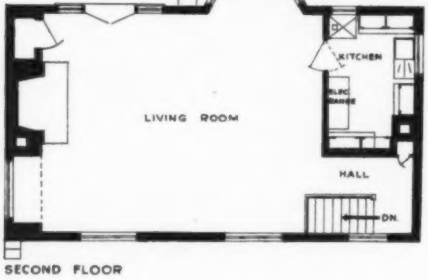
Rear of GARAGE, in which is located the heating plant, furnishing washed air as well as heat to the house. Roof: slates. Windows: steel casements with leaded glass. Walls: brick with raked joints.

WEEK-END COTTAGE,
CLIFTON TIDHOLM AND ELWOOD KOCH
OGDEN DUNES, INDIANA
HARRY HOWE BENTLEY, ARCHITECT

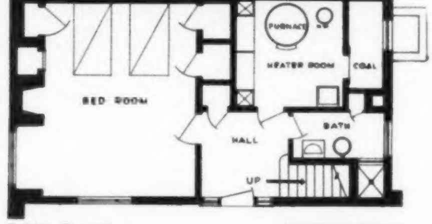
Site: slope of dune allows part of lower story to be above grade: bedroom and bath are placed here, and entire upper floor becomes a large living room.

Construction: haydite blocks, exposed and finished with white cement paint. Windows are metal casements. Roof of asbestos shingles.

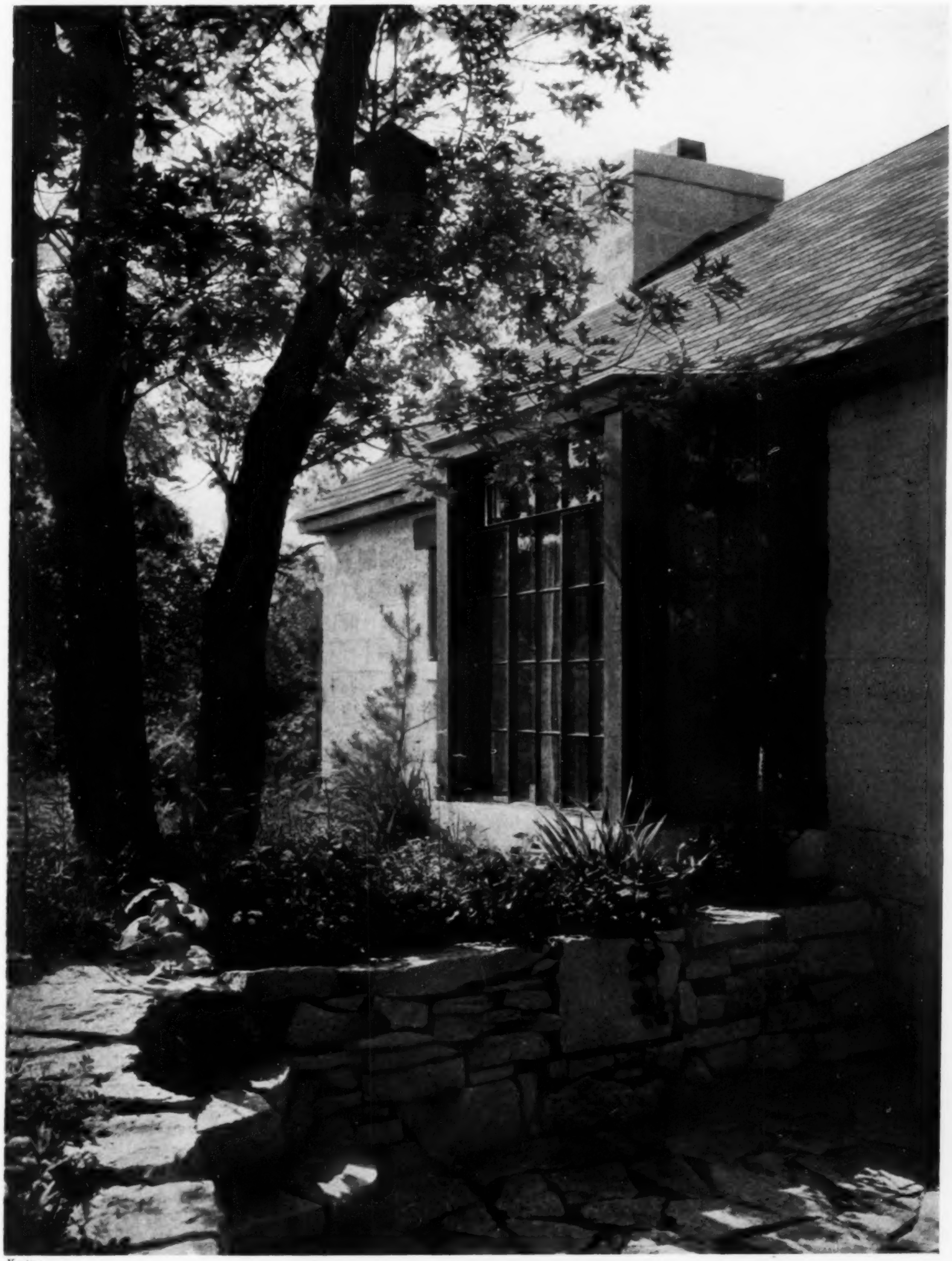
Cost per cu. ft.: about 45c, including water supply and sewage disposal systems.



SECOND FLOOR



FIRST FLOOR



Korling

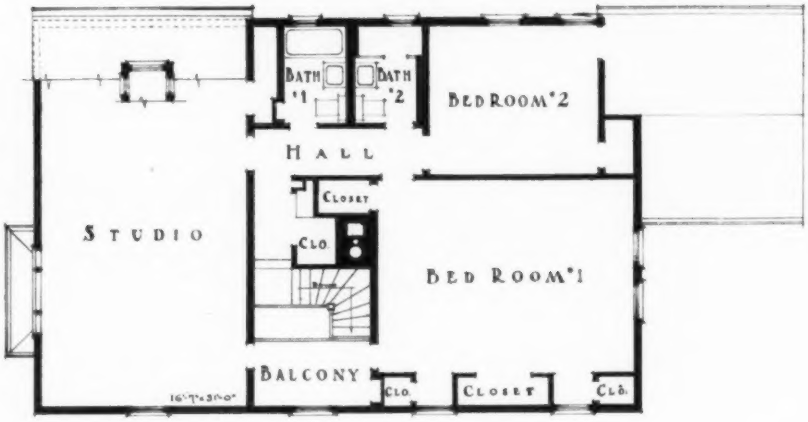
WEEK-END COTTAGE OF CLIFTON TIDHOLM AND ELWOOD KOCH
OGDEN DUNES, INDIANA
HARRY HOWE BENTLEY, ARCHITECT

Trefts

HOUSE FOR E. H. PARKS
HAMPTON PARK
ST. LOUIS COUNTY, MO.

A. B. M. CORRUBIA,
ARCHITECT

E. H. PARKS,
LANDSCAPE ARCHITECT



Trefts

HOUSE FOR E. H. PARKS
HAMPTON PARK, ST. LOUIS COUNTY, MO.
ANGELO B. M. CORRUBIA, ARCHITECT

Site: house set back about 300′ from road and about 25′ in back of a small creek.

Points of interest in design: house was designed primarily as a studio residence and as a setting for a collection of early American furniture.

Roof: underside left exposed, forming the ceiling of the second floor. Insulation from celotex covered with wood shingles with a $2\frac{1}{2}''$ air space. Ceilings painted and stained.

Color scheme: brick walls light red; siding and shingles stained brown; shutters painted a gray-green; window frames and main entrance stained brown; kitchen door and frame, porch door and frame, painted blue; copper work left natural. All floors throughout were yellow pine of random widths, being painted in some rooms and stained in others.

Total cost: $20,000. Cost per cu. ft.: 42c.

Trefts

HOUSE FOR E. H. PARKS
HAMPTON PARK, ST. LOUIS COUNTY, MO.
ANGELO B. M. CORRUBIA, ARCHITECT

Gillies

HOUSE OF H. M. LEINBACH

WYOMISSING, PA.

LEWIS BOWMAN, ARCHITECT

ELMER A. MUHS, LANDSCAPE ARCHITECT

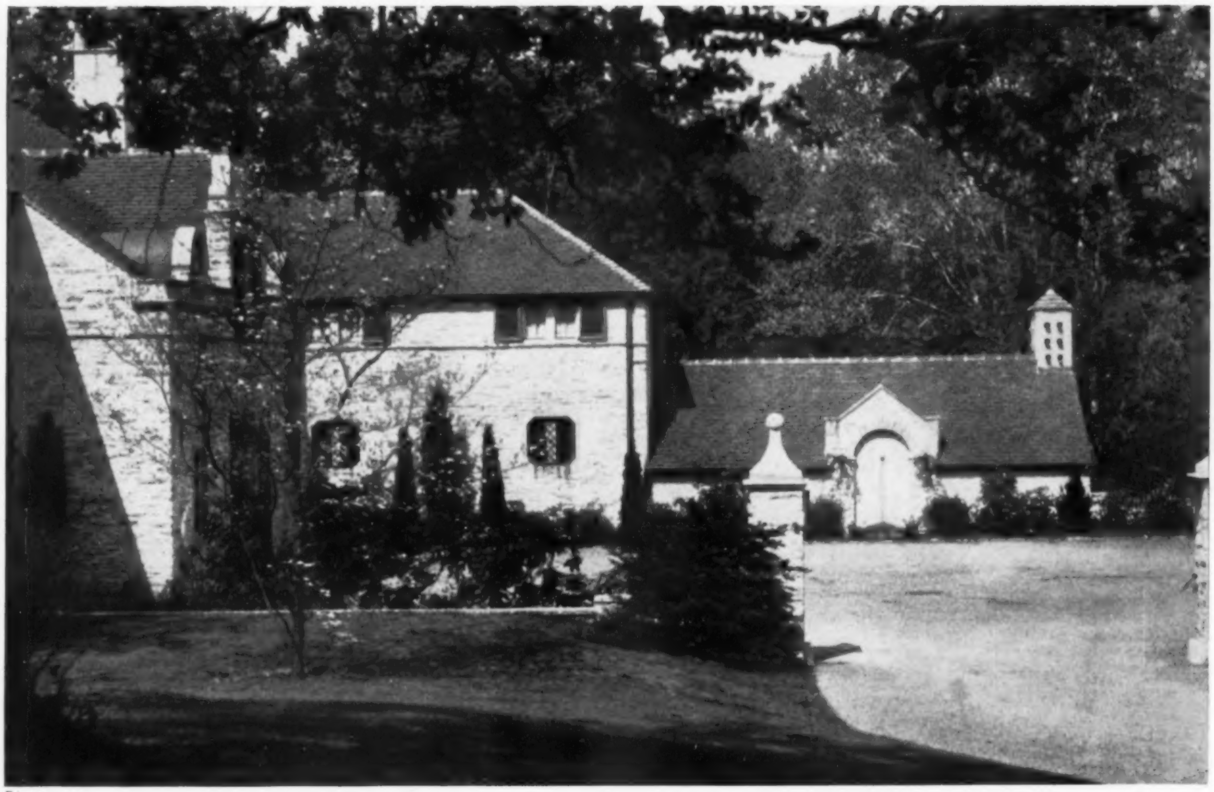
Site: a continuous slope. The entrance court was cut into the bank.

Roof: weathering green and gray slate.

Chimneys: local pale red brick.

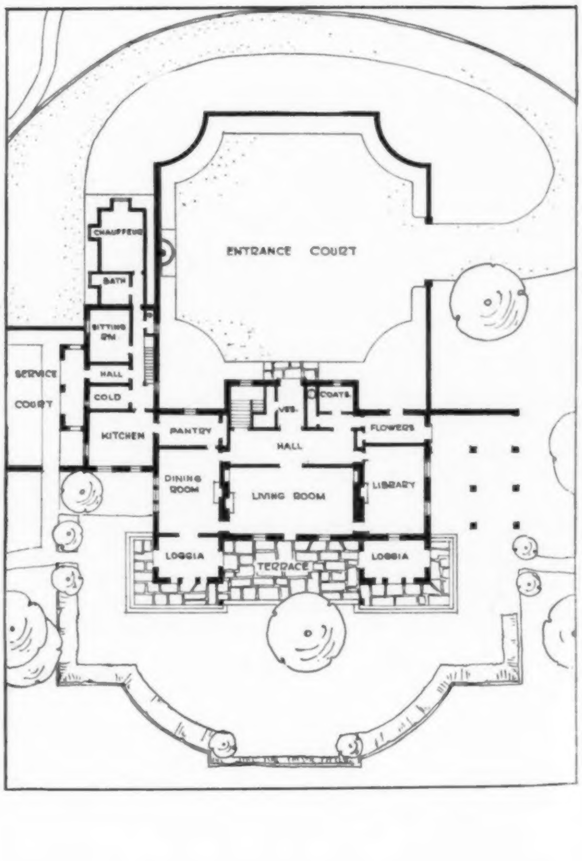
Windows: steel, filled with leaded glass.

Walls: native Pennsylvania ledge rock.



Rittase

HOUSE OF A. G. B. STEEL
CHESTNUT HILL, PA.
ROBERT R. McGOODWIN
ARCHITECT

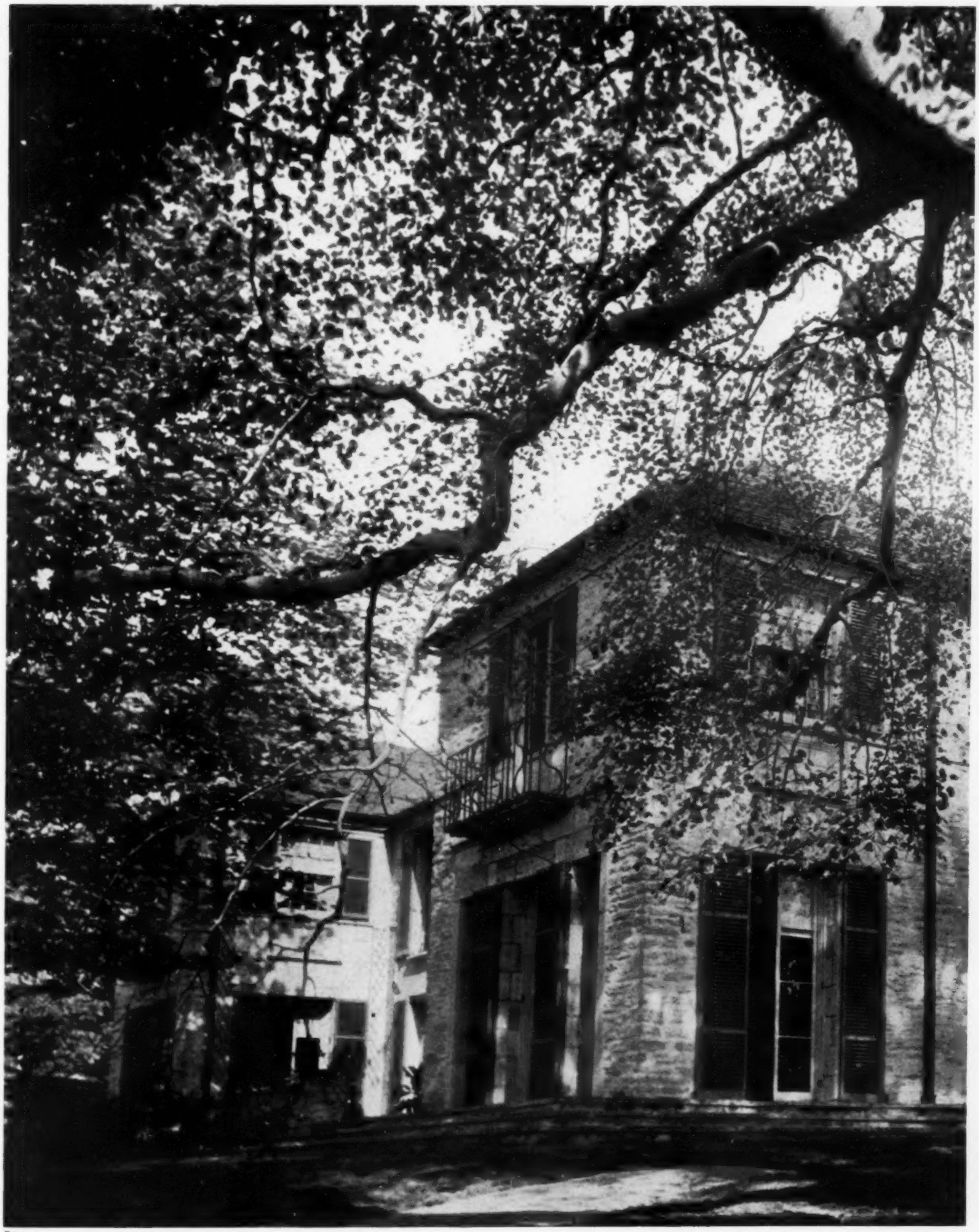


Site: wooded knoll comprising about ten acres. Steep contours permit use of basement of wing for large garage. Principal rooms have privacy, view of garden and southern exposure.

Roof: handmade shingle tiles of varying shades of dark red and brown.

Walls: local stone laid random range with flush joints, and washed grayish-yellow.

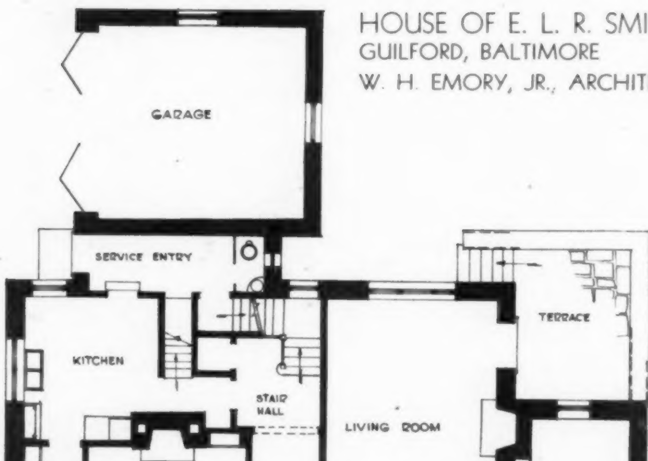
Chimneys: brick, washed with same mixture as walls, and capped with flagstone.



Rittase

HOUSE OF A. G. B. STEEL
CHESTNUT HILL, PA.
ROBERT R. McGOODWIN, ARCHITECT

HOUSE OF E. L. R. SMITH
GUILFORD, BALTIMORE
W. H. EMORY, JR., ARCHITECT



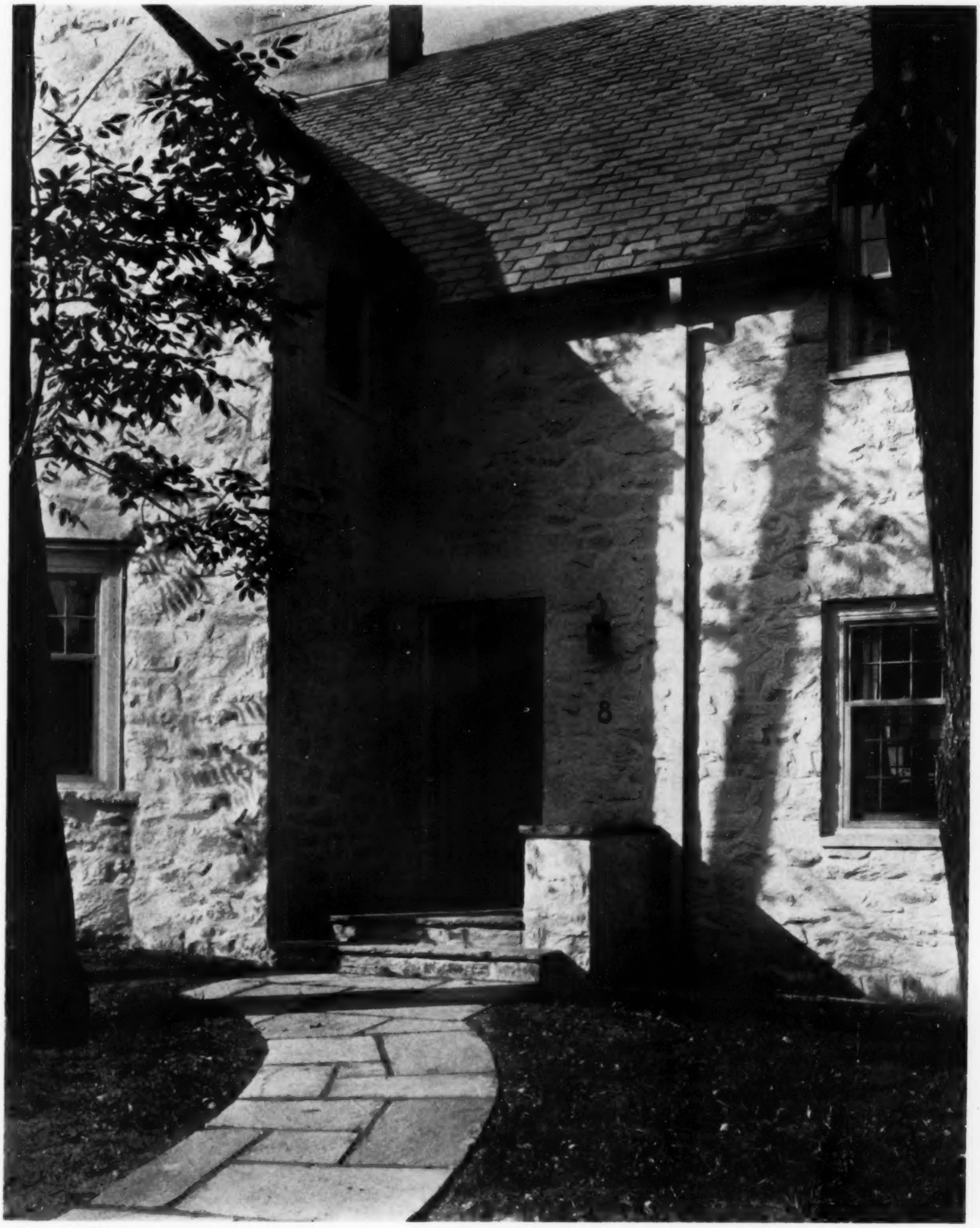
Site: difficulties were experienced in planning because of the narrowness and contours of the lot and location of a fine large oak tree, which it was desirable to keep without disturbing the roots.

Roof: unfaded green and gray-black slate, random widths, graduated, from 10" to 4" exposure.

Windows: double-hung with white exterior trim and very light-green sash.

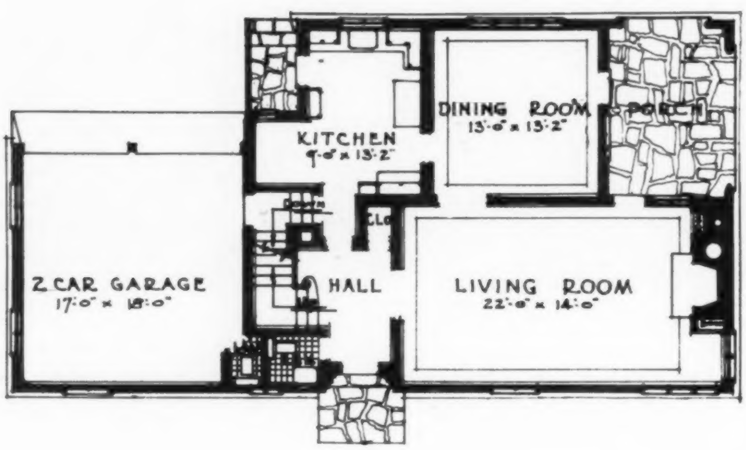
Walls: local quarry stone laid ordinary rubble with joints struck with trowel.

Cost per cu. ft.: about 46c.



HOUSE OF E. L. R. SMITH
GUILFORD, BALTIMORE
W. H. EMORY, JR., ARCHITECT

HOUSE OF MRS. J. WILLIAM LEWIS
RYE, NEW YORK
JULIUS GREGORY, ARCHITECT
J. WILLIAM LEWIS, LANDSCAPE ARCHITECT



Site: a level plot facing south with a brook at the rear.

Roof: shingles stained dark gray brown.

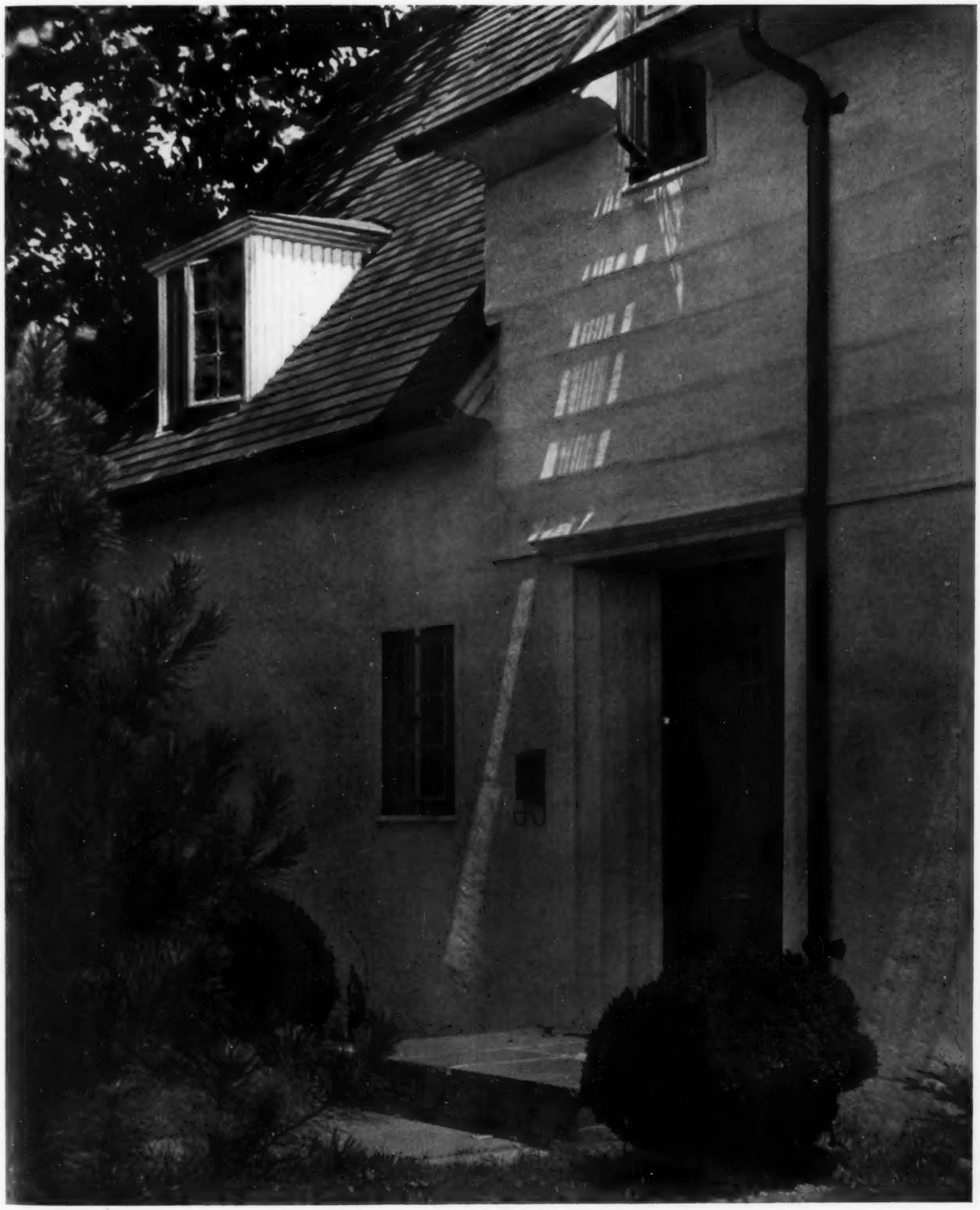
Chimney: white stucco.

Windows: steel casement, vertical glazing bars omitted.

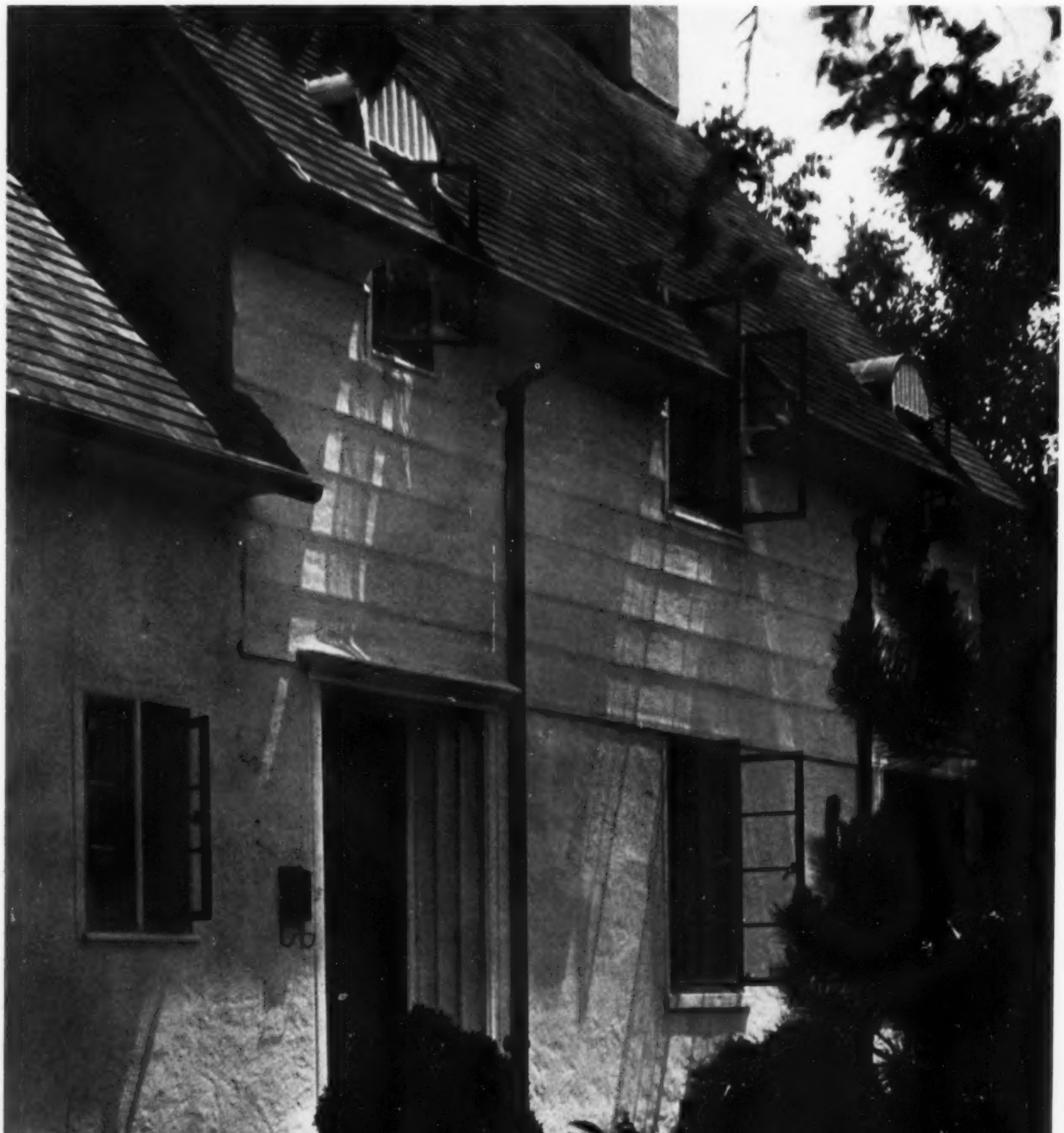
Walls: stucco on metal lath.

Cornices: stucco.

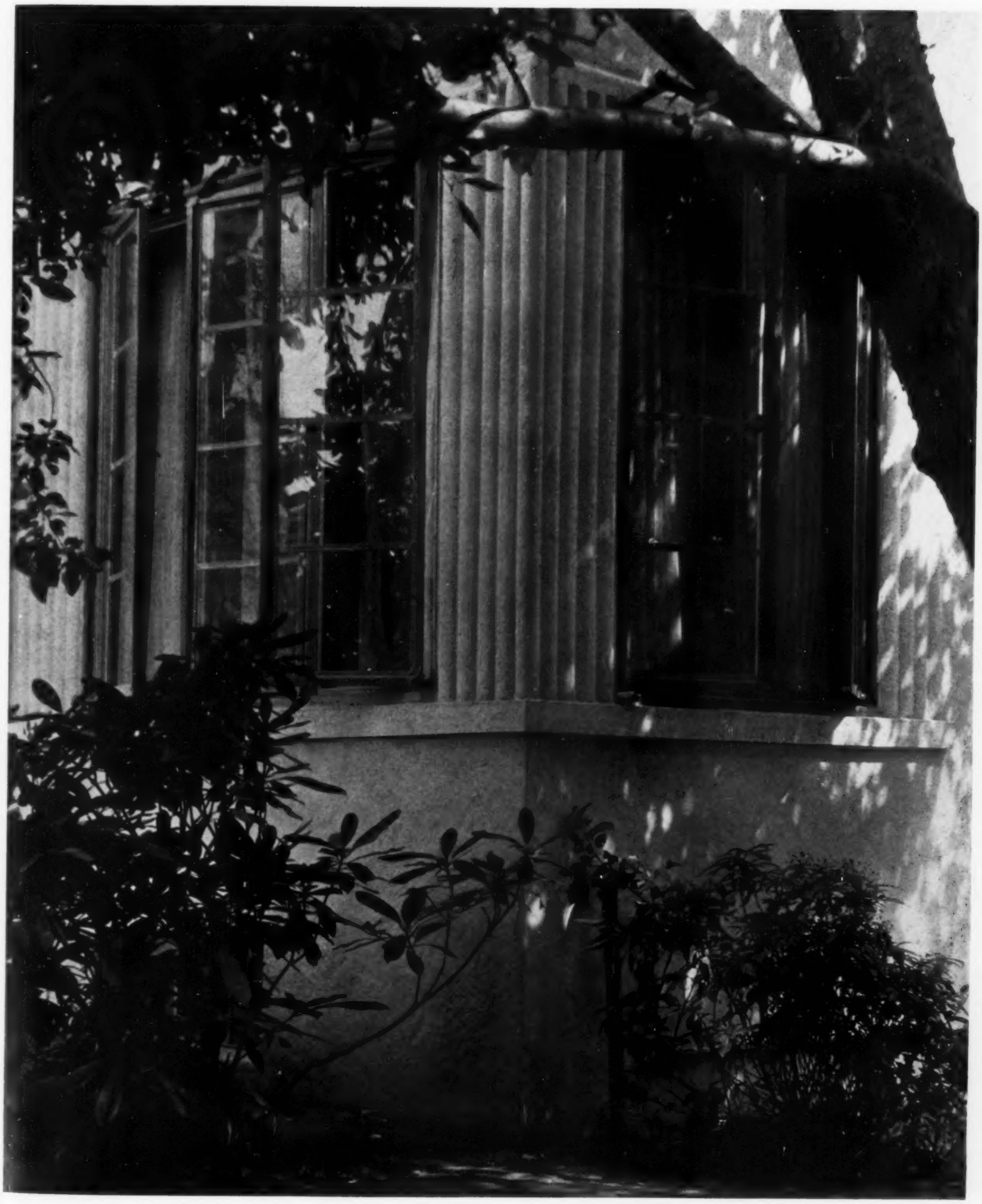
Color scheme: walls white; roof dark; sash warm gray.



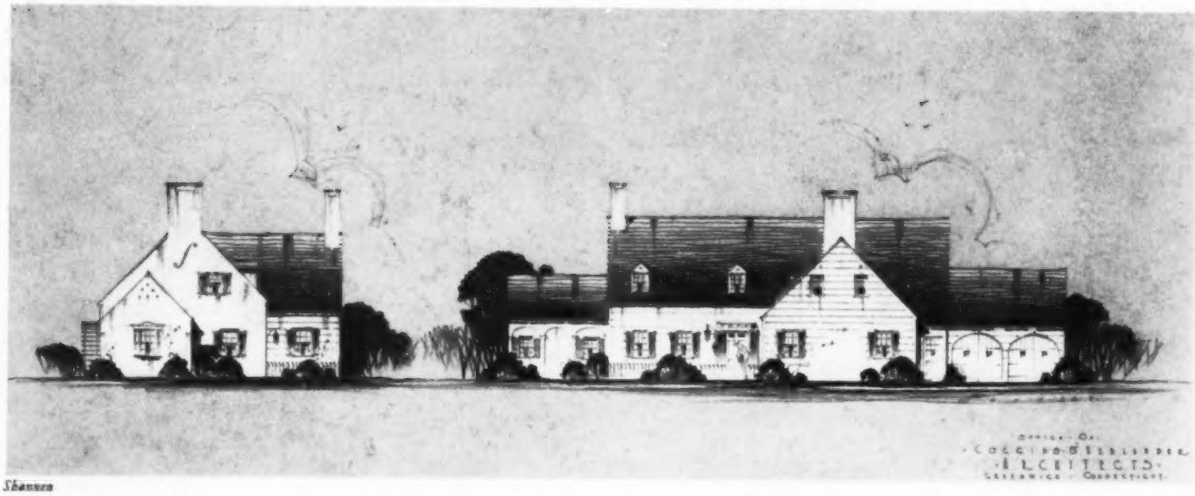
HOUSE OF MRS. J. WILLIAM LEWIS
RYE, NEW YORK
JULIUS GREGORY, ARCHITECT



HOUSE OF MRS. J. WILLIAM LEWIS
RYE, NEW YORK
JULIUS GREGORY, ARCHITECT

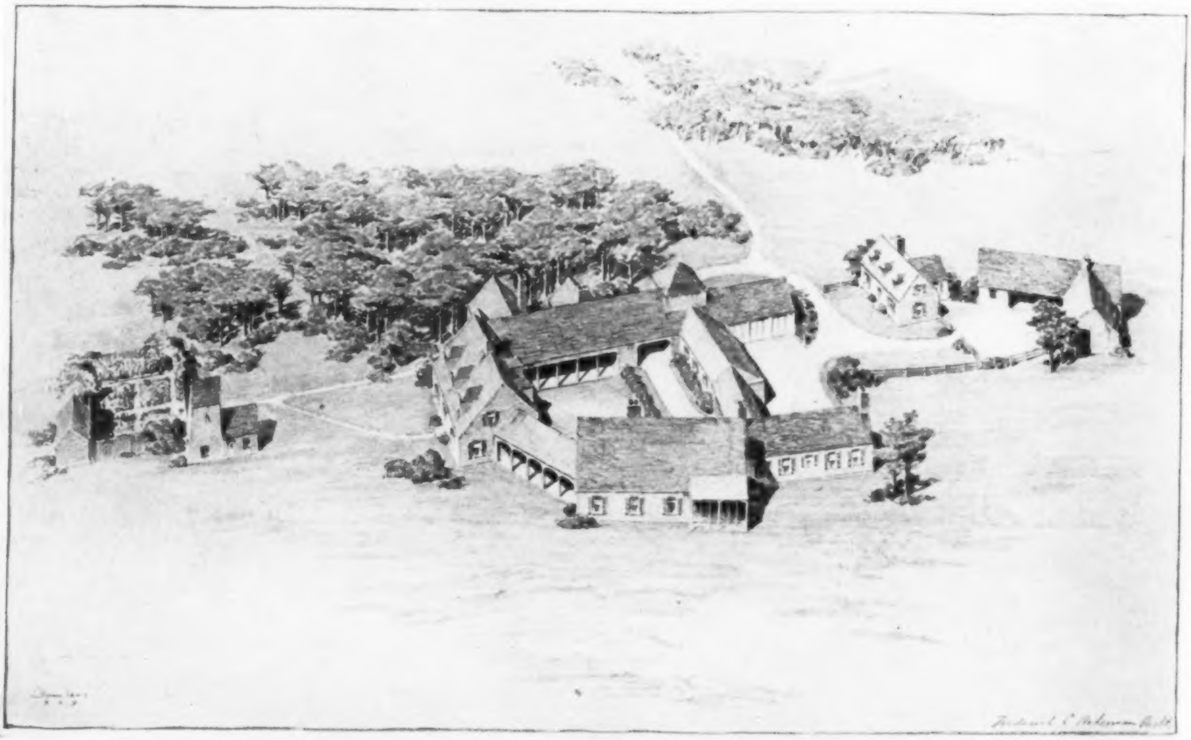


HOUSE OF MRS. J. WILLIAM LEWIS
RYE, NEW YORK
JULIUS GREGORY, ARCHITECT



Shannon

HOUSE DESIGN
COGGINS AND HEDLANDER, ARCHITECTS



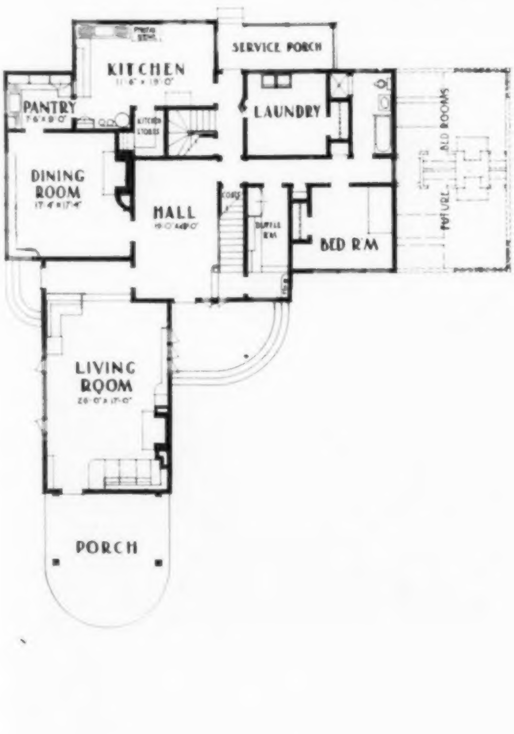
Shannon

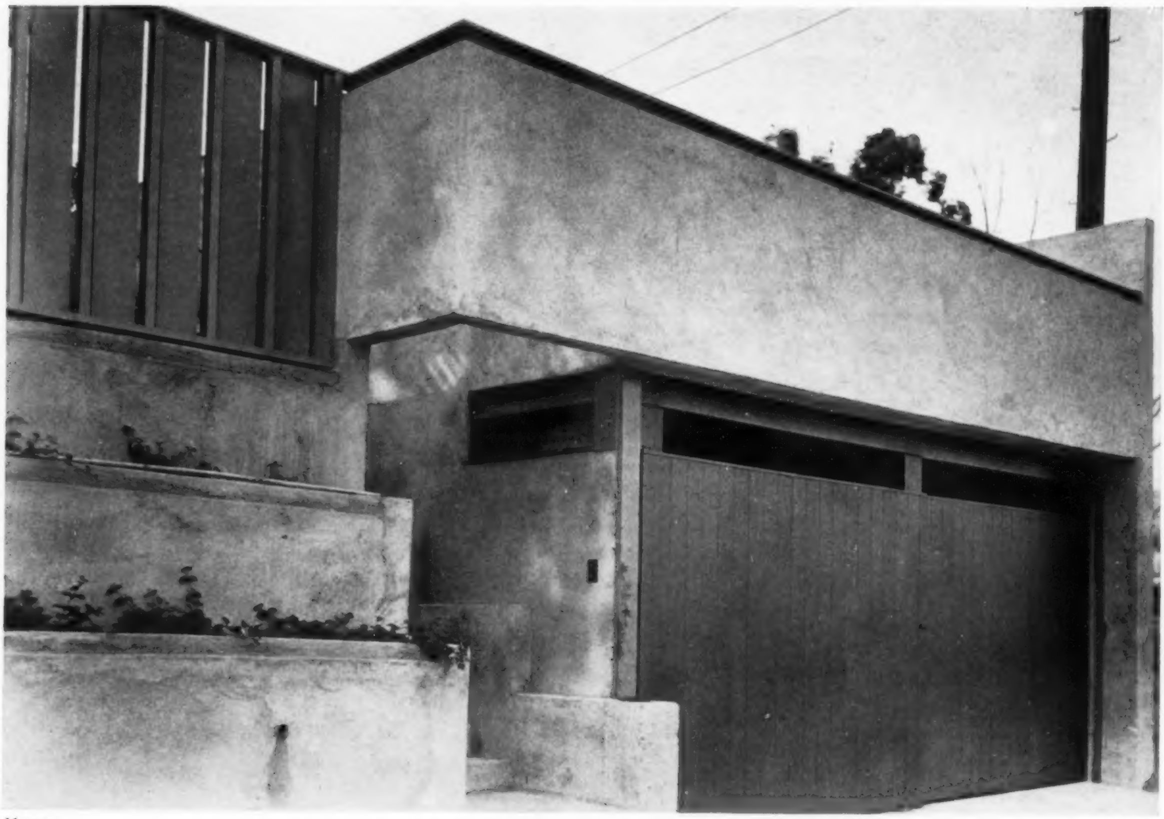
HOUSE FOR RANDOLPH PACK
NANTUCKET, MASS.
FREDERICK L. ACKERMAN, ARCHITECT

Courtyard provides shelter from breezes coming in over the moors. Walls and roof of hand-split shingles. Chimneys of brick. House designed primarily for summer use.

HOUSE OF G. LYMAN PAINE
NAUSHON ISLAND, WOODS HOLE, MASS.
J. C. B. MOORE, ARCHITECT

The house has no cellar. Exterior is made of 12″ Redwood boards running horizontally, between which are rabbetted drip strips of cypress, all finished with oil and laid over 1″ furring strips running vertically. These hold very heavy roofing paper in horizontal bands and provide air space. On the inside the walls are finished with 1/8″ Solidon on insulation board 1/2″ thick. This board is used on all the ceilings also, 1/2″ thick on the first floor and 1″ under the roofs. Under the roofs the ceilings slope with the rafters and are unplastered.





Morgan

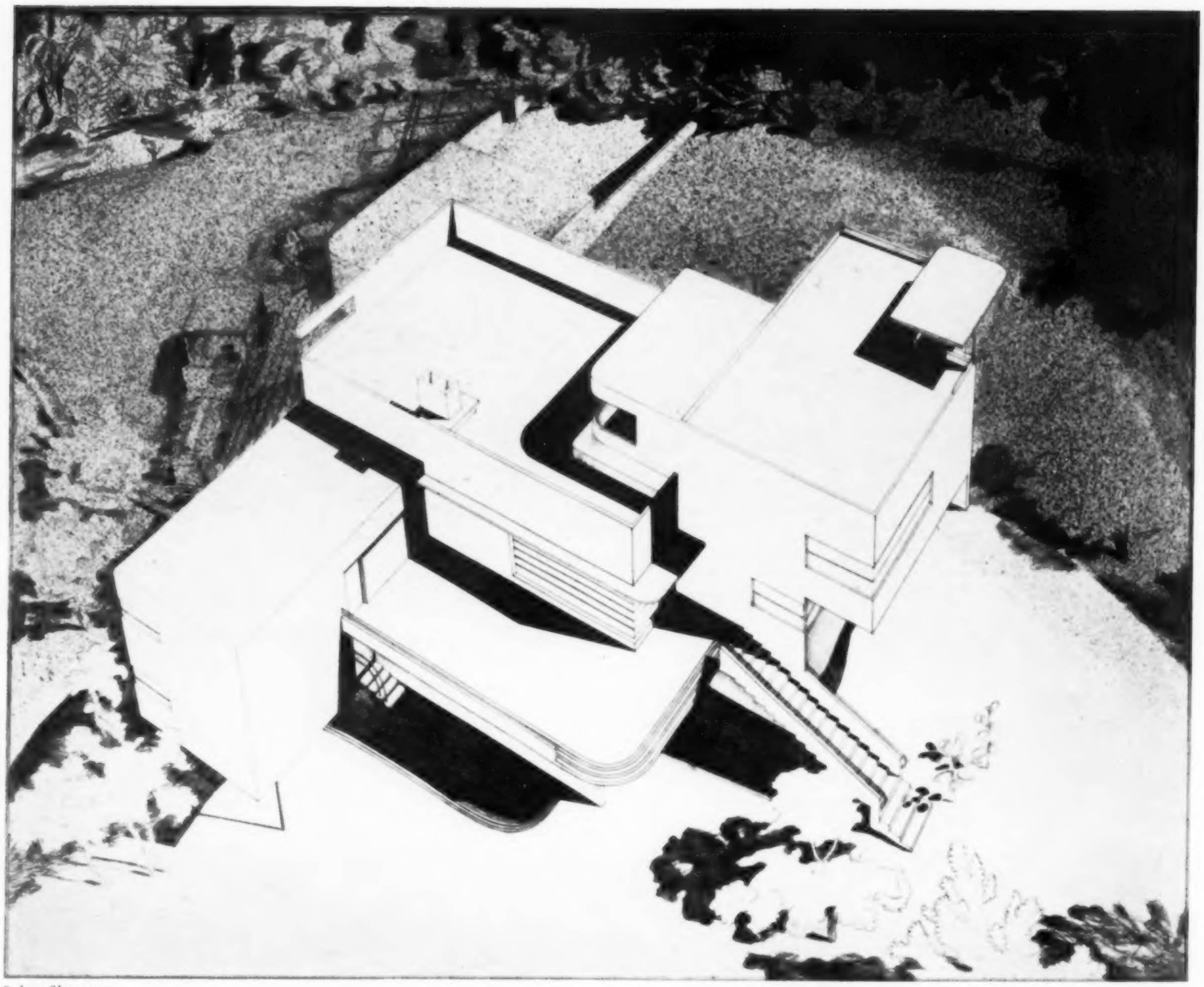
ENTRANCE
STUDIO OF CONRAD BUFF
LOS ANGELES
R. J. NEUTRA, ARCHITECT

Morgan

Built in 1911

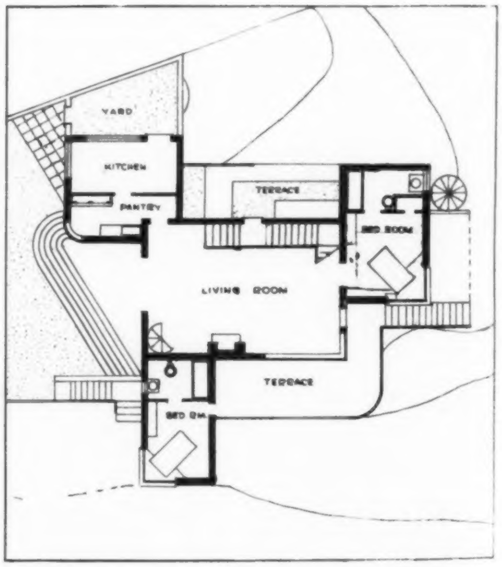
Morgan

HOUSE OF MARY BANNING
LOS ANGELES
IRVING GILL, ARCHITECT

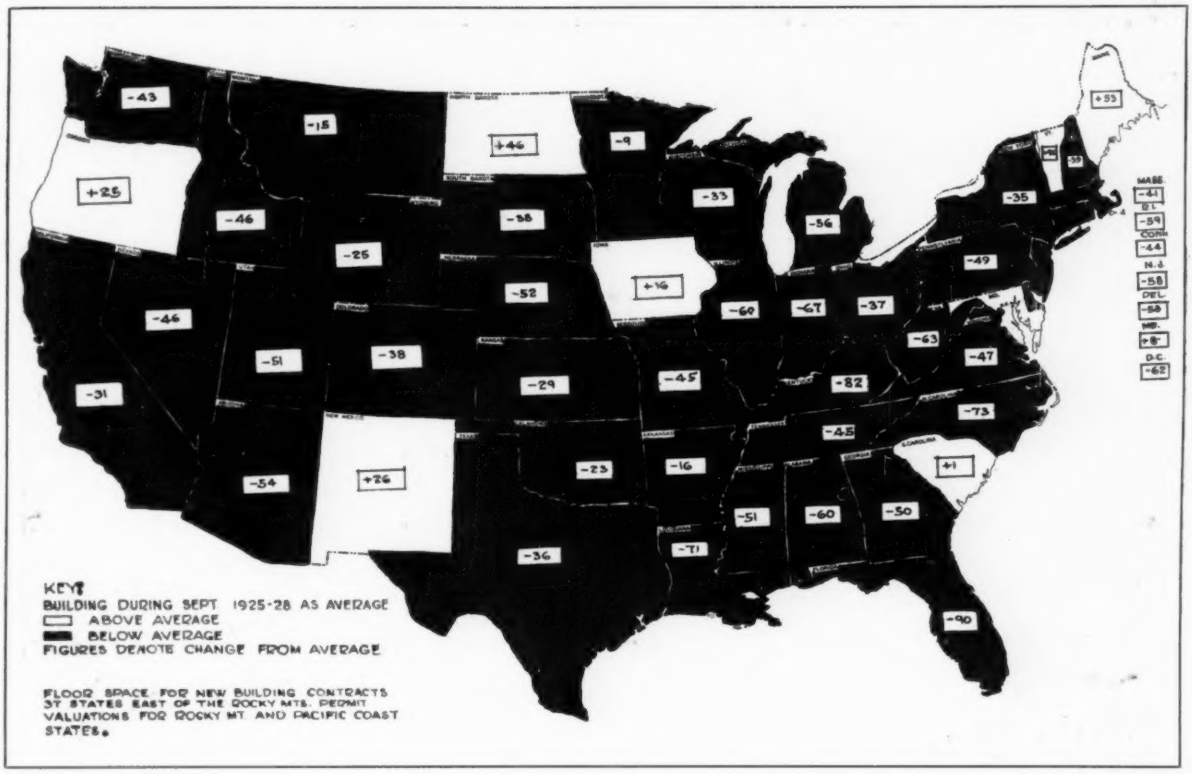


Palmer Shannon

HOUSE FOR MRS. G. F. PORTER
OJAI, CALIF.
HOWE AND LESCAZE, ARCHITECTS



Building consists of steel frame carried by concrete piers and walls. Wall built of two 3" thicknesses of masonry blocks, either tile or gypsum, with air space between stuccoed surface. Floors of light steel and concrete. Roof of gray flat tile. North and east walls, white; south and west, light blue; sash, dark blue; railing, white.



Though still spotty the September 1930 building map was more favorable than the August map. Eight states showed larger current new contract volumes than average (September 1925-1928); in August only five states showed new building above average.

BUILDING TRENDS AND OUTLOOK

ENGINEERING CONSTRUCTION AS IT RELATES TO BUILDING

The rapid progress in science and engineering during the past decade has wrought striking changes in our modes of living. Coincident with this transition, as much by cause as by effect, has come a remarkable development in the American skyline. Skyscrapers, residences, apartments, hotels, factories, schools are the more visible manifestations. But the broader consideration must count this development as only an incident in the processes that have made it possible. The septic tank, the clay road and the industrial smokestack are fast going the way of the coach and four while new engineering construction—power and lighting plants, sewerage and water systems, highways, bridges, and myriad lanes of communication—have opened up new fields for even further development in building modes.

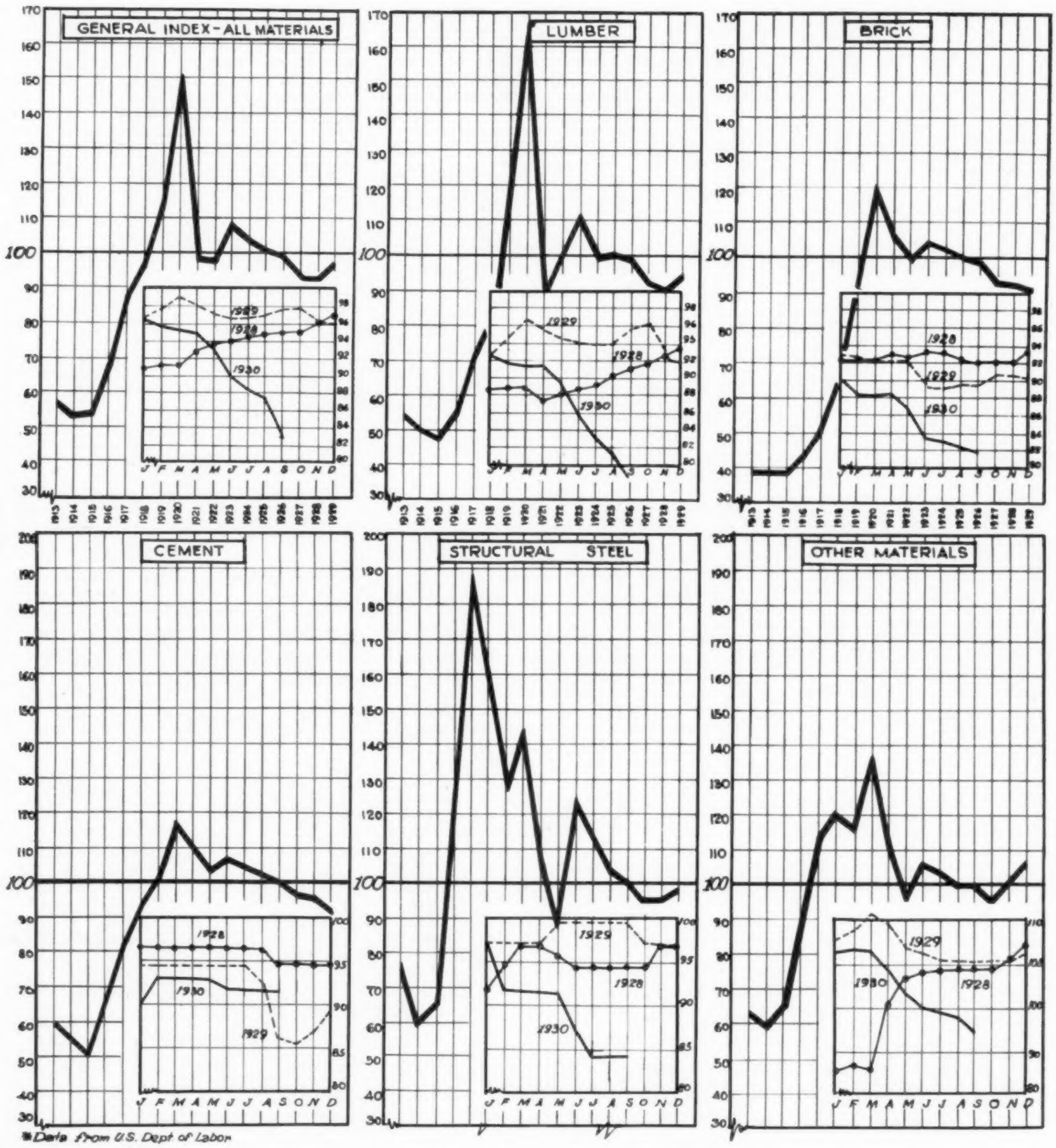
The automobile, the subdivision, intraurban population and business shifts, the electrification of industry—these and many other evidences of our rising living standards have put public authorities to the task of making further advances possible, while our privately owned utilities have methodically planned for this expansion and in this way are obtaining the rewards to which capital and initiative are justly entitled.

The construction of public works and utilities, despite all that has been said of them as a stabilizing influence to business, is still activated for the most part by conditions within the building industry itself and business conditions generally. During the period from 1919 to the end of 1929 public works and utilities representing new permanent improvements and extensions have contributed only 20 per cent to the total construction volume, with the remaining 80 per cent expended on building, both private and

(Continued on page 90, advertising section)

WHOLESALE PRICES FOR BUILDING MATERIALS

1926 monthly average = 100



*Data from U.S. Dept of Labor

Building material prices, as measured by the general index, moved downward further during September but showed only slight change during the early weeks of October. General commodity prices likewise declined in September with building material prices approaching the general commodity index. Labor cost indexes still fail to register any perceptible declines, though the General Building Contractor index disclosed for September the first movement in months, which in this case was downward. In the meantime, money is plentiful and continues to accumulate. With increasing activity in residential building, particularly apartments, which has recently manifested itself, it would appear that conditions making for revival in this branch of the industry are growing more favorable.

SCHOOL LIFE . . .

is hard on Paint . . .

Interiors at the Camden County Vocational School, Camden, N. J., are handsome, well lighted, spotlessly clean. And lastingly so, for the building is painted throughout with Barreled Sunlight.

. . .

Architects:
Lackey and Hettel, Camden, N. J.

REGULAR classes by day . . . adult classes by night . . . basketball and dancing in the gym . . . the modern school plant has come to occupy an important position in community life.

Proper maintenance of buildings and equipment grows constantly more difficult. One problem, however, has ceased to worry many architects, school authorities.

In hundreds of communities, the satisfactory upkeep of painted interiors has been entrusted to Barreled Sunlight.

Conspicuously good looking . . . surprisingly resistant to dirt and to yellowing . . . readily washable . . . contributing materially to efficient working light . . . easily tinted any desired shade . . . Barreled Sunlight combines to an unusual degree the qualities essential to efficient, economical service in the modern school building.

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U. S. Gutta Percha Paint Co., 22-K Dudley Street, Providence, R. I. Branches or distributors in all principal cities.

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Please send me your descriptive booklet, and a panel painted with Barreled Sunlight. I am interested in the finish checked here:

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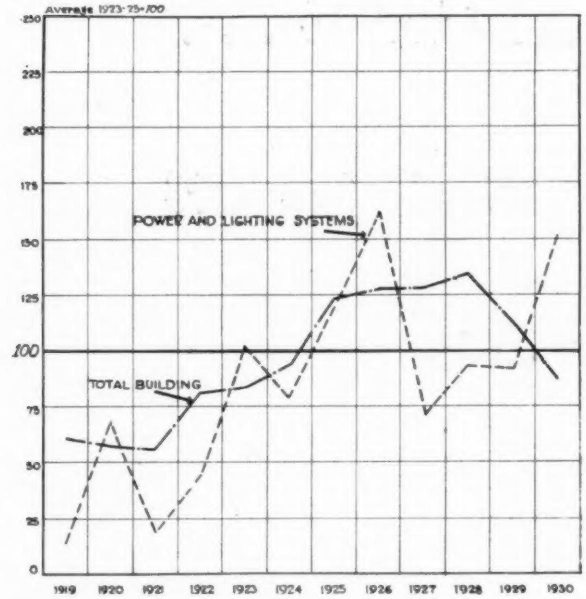
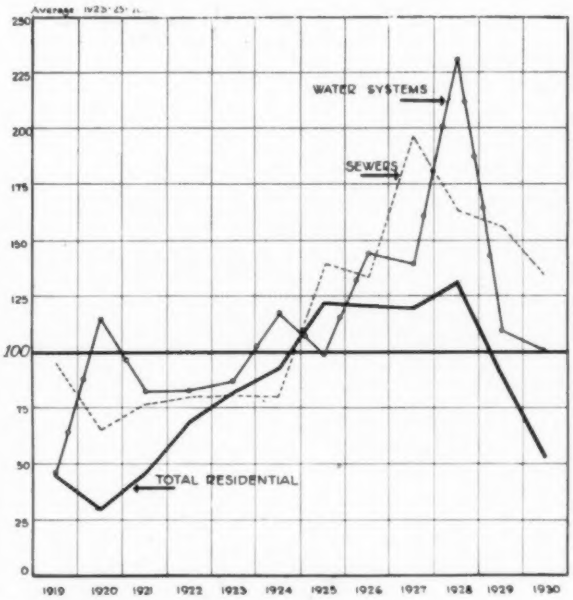
BUILDING IN 27 NORTHEASTERN STATES: 1919-1930

A comparison with typical classes of public utilities; 1930 partly estimated.



BUILDING AND POWER AND LIGHT SYSTEMS

Expenditures for new power and lighting systems over the past few years have paralleled more closely than any other class of public or quasi-public construction the trend in expenditures for new buildings of all types.



RESIDENTIAL BUILDING AND SEWERAGE AND WATER SYSTEMS

Under stimulus of easy money, rising realty values and larger tax levies, our state and municipal governments have apparently expanded their expenditures on sewerage and water systems beyond what now appears to have been the economic demand.

(*Continued from page 442, editorial section*)

public. None the less, were a sudden halt called in all engineering works the building industry, as we know it now and this goes for our living standards, would soon become decadent, for there is no branch of building which does not derive new life from the arteries of communication, power, light, sewerage and water systems.

Some types of public works and utilities are more readily attuned to building conditions than are others. The line of distinction seems to be one of ownership. Those undertaken by public authorities with public moneys show the lesser relationship, though indeed there is some, while utilities construction financed by private capital shows the greater relationship to building and underlying business conditions.

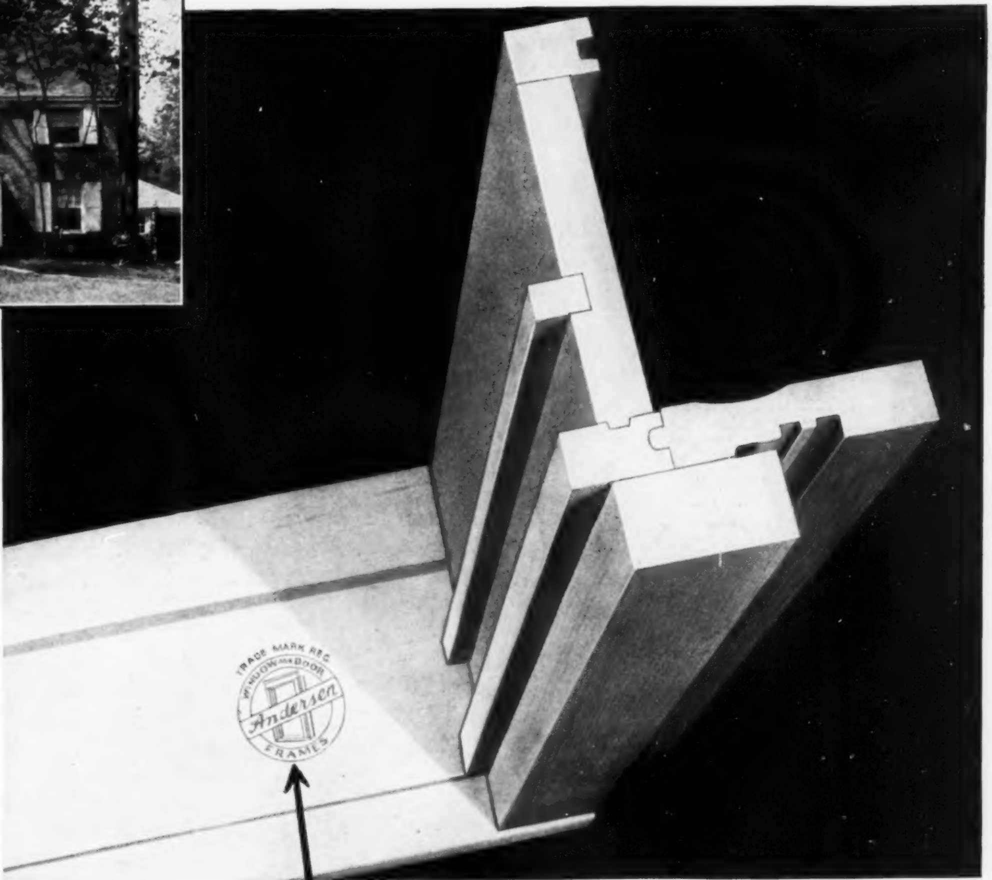
Thus expenditures for highways, which over the past decade have accounted for about 50 per cent of all public works and utilities, have moved rather independent of conditions peculiar to building, though even here, without larger and ever larger diffusion of automobile ownership and the attendant traffic problems, subdivisions and suburban realty developments could hardly have been possible on the scale of the past decade.

All remaining engineering construction over the period under review contributed only about 10 per cent of the total expenditure for construction, inclusive of building. Thus it may be seen that railway construction including buildings, bridges, power and lighting systems, sewerage and water systems and water front developments, have had only small influence in the total volume of new construction. But their effects upon building far exceed this indicated small relationship.

Sewerage disposal and water systems, like highways, are principally undertaken by public authority, while railway construction and power and lighting systems are almost entirely privately owned. Expenditures for sewerage disposal and water systems over the past decade have, it would appear, far outrun the demands of new building. Taking the years 1923 to 1925 as a basing point, water systems ranged from 45 for 1919 to an index well above 225 in 1928, the peak building year, though residential building in the same period showed a low point of about 30 for 1920 and a high point of only about 130 for 1928.

Sewerage systems over the same period ranged from a low of about 65 for 1920 to a high of about 195 for 1927. Water systems declined sharply in 1929 and 1930 while the decline in sewer systems, though less

Architects turn to this new frame with locked sill-joint for better construction



Andersen Master Frame for brick veneer buildings, Model No. 651.

To get greater building value, per every dollar invested, architects today are turning more and more to the new Andersen Master Frame with the new locked sill-joint construction.

Now they get real custom frame value at stock frame price—plus a big saving in labor costs—with Andersen Master Frames.

They appreciate the genuine white pine, the chamfered blind stop, the steep sill slope, the inside liner, the noiseless pulleys—the many other exclusive Andersen features.

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FOR WEATHERTIGHT INSTALLATIONS—USE ANDERSEN SPECIFICATIONS

drastic, has continued since 1927. The record discloses that during the first half of the period beginning 1919 both water and sewerage systems pretty much paralleled residential building. But for the latter half of the period, under the stimulus of easy money, rising realty values and larger tax levies our state and municipal governments expanded their expenditures on these items beyond what seems now to have been the economic demand. As a matter of fact it may now be said that new residential building had, during the years since 1924, been carried on in a volume in excess of our ability to consume housing, in the light of which the excess construction of sewerage and water systems, particularly in suburban areas, has placed an even heavier burden upon real estate from the investment standpoint. What is said of sewerage and water holds for all other engineering construction under governmental authority. As a result of this our taxing authorities have more or less arbitrarily had to increase realty assessments to provide the needed taxes to retire the indebtedness which this expansion has incurred.

It would appear that this condition presents a real problem to planning commissions, architects and real estate boards, since it may develop as an important limiting factor on new building by private funds.

Where building is financed principally by private funds engineering works are entirely financed by public moneys, present and in prospect, and private capital willing to submit to public supervision.

Expenditures for new power and lighting systems over the past few years paralleled more closely than any other class of public or quasi-public construction the trend in expenditures for new building. Though there have been periods when one or the other was on a higher plane, in general their lines of growth over the past eleven years have been strikingly similar. This is more than accidental. These utility types for the most part are owned by private capital. Their engineers are charged with the task of showing earnings on capital and in this must survey the needs arising out of changing trends in population, housing, shifts in commercial and industrial sections. Conduits, cables, trunk lines—these are part of capital which must bring dividends and pay bond interest even under the limitations of public supervision.

Some considerable time naturally elapses before plant extensions and enlargements can show earnings; so much more, then, is it necessary for the utility companies to anticipate future needs correctly. And this, in the past decade, they seem to have done well. That power plant extensions and enlargements of lighting systems have shown consistent growth since 1926 even in the face of our present depressed building and business conditions is nothing more, it would appear, than a recognition that the long-term demands are still rising and that no time is more propitious for the development of our privately owned utilities than a period of depression when commodity markets, labor conditions and money rates are favorable to economic expansion.

The electrification of industry and the growing use of natural gas in the arts are eliminating the industrial smoke nuisance and providing a greater opportunity for architectural directness in the design of our industrial plants. In this process our factory buildings in many instances are becoming obsolete, and in the rehabilitation which seems likely, because of the relative ease in money and construction costs, American industry may be on the eve of large building activity in which the alert architect will play an increasingly important role.

New architect-planned industrial plants undertaken during the first nine months of 1930 showed a loss of only 25 per cent from the corresponding period of 1929. At the same time, engineer-planned factories which are the more important, showed a loss from 1929 amounting to 32 per cent. As a matter of further interest in this connection all architect-planned non-residential building during the first nine months of 1930 declined only 12 per cent from the corresponding nine months of 1929, while non-residential building planned by engineers or undertaken from private plans showed a loss of 30 per cent.

In the meantime it is becoming increasingly clear that the stimulus to construction and business generally which has been feebly provided by large public works construction is abating. It is indeed of large significance that the record-breaking awards for public works and utilities for the first nine months of 1930 have been almost entirely due to such undertakings by private capital, principally for the erection of pipe lines and power plant extensions, but for which even engineering would now be running behind 1929.

Quite naturally there are limits to the taxing powers of our states and municipalities. Even the Federal Government, which derives its revenues principally on earned incomes under our present system of taxation, is faced with lower revenues for 1931 in the light of the depressed business conditions of 1930. Then, too, public debt limits of most of our states and municipalities have been either reached or are uncomfortably close.

Thus the relationship between building and engineering construction is of large importance, with a need for closer gearing of publicly owned projects to building demands. To burden land with taxes for public improvements, however meritorious, for which no present reasonable economic need exists seems to offer an obstacle—though by no means the only one—in the way of early restoration of large new-building activity, which of necessity must proceed from a fundamentally sounder basis than has attended the large activity that was so abruptly brought to a close months ago.

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